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## ORIGINAL COMMUNICATIONS.

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### THE DECREASE OF AFTER-NYSTAGMUS DURING REPEATED ROTATION.\*

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Everyone knows that a rapid turning-about upon the heels usually leads to dizziness and that a like state is induced in the revolving chair or the turn-table of the laboratory or in the merry-go-round of street fairs. It is also known, especially among those who have attempted to analyze the complicated experience of dizziness, that an important constituent of this disturbed state of mind and body is a characteristic movement, to-and-fro, of the eyes. To this ocular twitching, which is sometimes called "nystagmus," is due, in large measure, the apparent swimming movement of surrounding objects. The twitching appears soon after rotation begins and it continues, with characteristic modifications, for a short period after the body comes to rest.

The bodily and mental effects of rotation in man and in other animals have for a good many years been made the subject of investigation by physicists, anatomists, physiologists, psychologists and medical men. It is supposed that rotation produces a specific effect upon the neural end-organs of the semicircular canals, and it is definitely known that, in addition, pretty much the entire organism is involved in the general disturbance. Concerning the ocular movements themselves, a good deal has been learned. We know, for example, that the character and the duration of the nystagmus depend upon a large and heterogeneous group of conditions, among which may be named the general state of the organ-

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ism, the state of attention, the associative connections, the rate, regularity and duration of the rotational movements, repetition and practice, and other mental and physical conditions. Of these conditions, we are here concerned with one only, *i. e.*, with the effect of regular and continued repetition upon the ocular movements in question.

It has been commonly observed that long persistence in whirling movements may reduce in intensity the distressing symptoms of dizziness. This reduction under repetition has suggested that the accompanying ocular movements may also tend, under persistent practice, to disappear. The testimony of whirling dancers and gymnasts, who are frequently undisturbed by the swimming and the giddiness, points in this direction,<sup>1</sup> and further evidence, of an experimental sort,<sup>2</sup> has recently been derived from subjects who were rotated about three minutes daily for two or three weeks. At the end of this period the subjects had lost, either wholly or in part, the "after-nystagmus" which usually persists, as we have seen, when the body has come to rest.

Now these experimental results have been sharply criticized by two otologists, Drs. Fisher and Babcock,<sup>3</sup> who are distressed that the stability of such a "reflex reaction" as nystagmus should be called in question. "Clinical medicine has," as they observe, "for years relied upon the permanency and the constancy of reflex phenomena." As for the results just referred to, they set them down as "pathological." Professing to repeat the experiments, but wholly missing the essential point of the method which they criticize, these men have come, not unnaturally, to a conclusion which is not antagonistic to the dogma of the invariable reflex. Despite the miscarriage of their method, however, they do find a certain amount of reduction in time of nystagmus and this reduction they propose to explain by the voluntary "gaze-fixing" of "a few subjects." Although the abortive attempt of Fisher and Babcock affords no positive evidence against the demonstrated reduction of nystagmus under repetition, it has suggested an *experimentum crucis* which is designed to show that the reduction is *not* an artefact produced by the "willful gaze-fixing" of inconvenient subjects who acquired "the art of holding the eye more or less voluntarily" upon a "distant object."

As a matter of fact, these authors unwittingly furnish the most delicate and unimpeachable evidence *for* the very reduction which they deny. Although they apparently omitted to repeat at each sitting, giving each of the ten subjects included in their Table II

only one turning to the right and one to the left, *in every single case the average nystagmus-time is less for the second five days than for the first five days.* That is to say that a *single turning* each day (not a series) is sufficient to reduce the time for subsequent days. The tendency to reduction must, then, be much greater than the first experimenters had contended or supposed.

We have chosen the white rat as a subject in our crucial experiment. The rat is admirably adapted to this sort of problem. It is docile and easy to handle. The lack of a fovea and of distant vision and the probable absence of all clear-cut retinal images<sup>4</sup> seem to provide the optimal conditions of non-fixation as suggested by the otologists' contentions. On the other hand, the pupil of the rat's eye is easily observed, as well as those portions of the sclerotic coat which project beyond the surrounding cutaneous and hairy tissues.

The following method of rotation and observation was employed. Upon a pivoted wooden platform, 11 cm. x 20 cm., was set a glass bell-jar 11 cm. in diameter and 12 cm. in height. The rat was so placed under the glass jar that its center of gravity lay over the center of rotation. A small motor, governed by means of a friction-brake, served to provide a very regular and easily controlled means of rotating the platform and the jar. Records of the time of after-nystagmus were at first made with a stop-watch, but later with a key connected to an electric signal-marker which registered on a revolving smoked drum.<sup>5</sup> It was found, by preliminary trials, that the appearance of the nystagmus was directly proportional to the *number* of rotations and to the *speed* of rotation. For experimental purposes, an arbitrary choice was made of a speed of ten revolutions in fifteen seconds. Ten trials of ten rotations each were repeated two or three times a day, save for subjects "I" and "J," which were given twenty trials twice a day. The subjects were ten white rats, five males and five females, all about three months old. The functional integrity of the mechanisms of equilibrium<sup>6</sup> was roughly determined by observing the rats' behavior under daily conditions of life, and by throwing them into the air and dropping them. All of the subjects responded quickly and positively to such tests. In the subsequent experiments each rat was rotated a like number of times to the right and to the left, and averages of the duration (in seconds) of the nystagmus after stopping were computed. A comparison of these averages from day to day may be made from Table I.

The outstanding feature of the investigation is the rapid decrease of after-nystagmus from day to day, as is clearly indicated in Table I. Within ten to eighteen periods of rotation the nystagmus

TABLE I

Subject,..... Direction of Rotation	A		B		C		D		E		F		G		H		I		J	
	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R
1	6.70	7.04	5.88	6.06	5.00	5.80	5.80	6.40	5.34	5.06	6.02	4.82	4.40	4.60	5.80	4.60	5.66	5.86	5.12	6.16
2	5.62	5.80	4.52	4.90	4.96	4.60	4.60	5.32	5.20	4.76	4.02	5.12	4.60	4.60	6.00	5.00	4.35	4.45	5.12	6.16
3	4.32	4.32	4.02	4.18	4.08	4.44	4.60	4.72	4.22	3.20	3.56	3.66	3.80	3.64	4.46	5.30	4.10	3.95	3.82	3.58
4	3.78	4.10	3.70	3.76	3.26	3.92	4.08	4.20	2.58	1.80	3.56	2.64	4.78	4.30	3.88	4.04	3.00	2.98	3.72	3.30
5	3.22	3.48	3.48	3.42	2.96	2.30	2.96	3.00	2.88	2.56	3.06	2.42	5.46	5.20	3.92	4.54	2.10	2.20	3.52	3.96
6	2.68	2.62	2.70	2.58	1.28	1.28	1.78	1.96	1.50	1.36	1.28	1.50	4.46	4.34	4.20	4.64	1.18	1.56	2.74	2.94
7	2.06	2.18	2.34	2.26	1.00	1.00	1.08	1.06	1.32	1.08	1.02	1.04	4.46	4.76	3.68	3.16	0.96	1.18	2.86	3.42
8	1.62	1.74	1.74	1.80	0.60	0.60	1.00	1.00	0.60	0.86	1.00	1.00	4.18	3.68	3.68	3.18	0.40	0.50	2.96	2.92
9	1.32	1.48	1.54	1.56	0.20	0.20	0.40	0.40	0.20	0.20	0.40	0.40	3.54	3.34	3.82	4.14	0.50	0.20	2.60	2.70
10	1.04	1.56	1.26	1.10	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.20	3.72	3.58	3.82	3.86	0.00	0.00	2.14	2.56
11	1.00	1.00	1.22	1.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.66	3.76	3.10	3.40	0.00	0.00	1.60	1.58
12	0.80	0.60	0.60	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.60	3.80	3.56	3.76	3.64	0.00	0.00	1.76	1.38
13	0.40	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.50	3.74	3.68	3.60	0.00	0.00	0.20	0.80
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.32	3.08	2.94	3.14	0.00	0.00	0.10	0.20
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.24	1.84	2.16	2.18	0.00	0.00	0.00	0.00
16													1.34	1.44	1.40	1.70			0.00	0.00
17													0.00	0.00	0.00	0.00				
18													0.00	0.00	0.00	0.00				
19													0.00	0.00	0.00	0.00				

Number  
of  
series



had completely disappeared. The number of ocular movements after stopping the platform was also observed. Upon the first rotation for each rat, the number of movements varied between 18 and 25. This number rapidly decreased during the first four or five periods to between 5 and 8, and soon became reduced to a single movement which generally remained for some time. As the rotation was stopped, the eye gradually moved in the direction of the preceding rotation and then jerked back to normal position. The disappearance of this one movement accounts for the sudden falling off of the time-values at the end of the various series. The average initial time of after-nystagmus for all subjects was 5.57 seconds for rotation to the left and 5.74 seconds for rotation to the right. Other averages testify to this difference in time for the two directions of rotation. This seems to be a genuine case of individual difference quite comparable to similar differences found in human observers.<sup>7</sup>

The fact of decrease from day to day is incontestable. Each column in Table I shows it. It is just as apparent, if, in each day's series, an average of the first two trials is taken and compared with corresponding values for subsequent days. That is, each day begins at just a little lower nystagmus time than the preceding day began. Furthermore, the decrease is of a characteristic kind. Table I indicates that at least one-half of the total decrease commonly occurs in the first few days of experimentation. The exceptions, subjects "G" and "H," will be considered later. In this respect, a "nystagmus curve" is quite comparable with the common "learning curve," save for the absence of plateaus.

TABLE II

Subject	L		R	
	I	II	III	IV
A	2.81	2.49	2.84	2.51
B	2.84	2.30	2.81	2.51
C	2.74	2.31	2.74	2.66
D	3.18	2.89	3.13	3.00
E	2.59	2.48	2.50	2.02
F	2.57	2.23	2.56	2.03
G	3.46	3.50	3.40	3.30
H	3.26	3.41	3.44	3.55
I	2.98	2.13	2.93	2.23
J	2.98	2.33	3.28	2.65

Again, the figures make it plain that there is also a general decrease in the time of after-nystagmus within any single day's turning. Table II indicates that this decrease was constant for all sub-

jects, save "G" and "H." An analysis of the material upon which the table is based shows that the main decrease within any single day falls early in the series—a result consonant with the early fall in time from day to day, as just mentioned.

Column I, averages of all the first two rotations to the left for all series; column II, the averages of all the last two rotations to the left for all series; columns III and IV, the same for rotation to the right.<sup>8</sup>

It must be emphasized that any decrease is for one set of conditions only. Only those values are given which resulted when the rat rested quietly on the floor of the rotated platform. Occasionally the rat would stand almost upright, in which case the nystagmus was almost invariably longer. Even after the disappearance of the nystagmus under *usual* conditions, this upright posture induced some after-nystagmus; but it is important to note that the time and the intensity of it were never so great (by more than half) as the original nystagmus in these positions. That is, there seems to be a "transfer" effect from one set of conditions to another. Changing the speed or the number of rotations at any time produced a similar reappearance of nystagmus, but never in its original intensity or temporal duration. Several of the subjects gave a nystagmus varying between twelve and twenty-five seconds when rotated once a second for thirty seconds before the practice series. After the practice series, these values were reduced to about the level of the original values for the rotation-rate used in the investigation, viz., 5-6 seconds. The change of position of the rat during and after rotation had to be carefully regarded; for such a change was frequently responsible for an increase of nystagmus-time that obscured a real decrease.

There are several matters of special importance.

1. It has been noted above that subjects "G" and "H" offer certain exceptions to our conclusions. Table I indicates that the length of their total series was greater than that of any of the other rats. These two subjects were females rotated during the period of gestation. Their rotation was marked by frequent and severe retching movements, defecation, and micturition. The period of gestation of subject "G" was three days short. "G" became too sick during the last reported turning to be used further, and a day later, during which time she did not seem to recover, a litter of two were born. These coincidences point directly to the fact that nystagmus is closely related to the organic condition of the individual rotated and they at least suggest the fruitfulness of further work upon this matter.

2. The fact that the white rat is a nocturnal animal<sup>9</sup> suggested that the time of day might make a difference in the values. Accordingly two rats, "I" and "J," were rotated twenty times twice a day, early in the morning and late in the afternoon. The results were as follows:

	I	J
Morning trials, rotation to left (ave.).....	2.24	2.81
rotation to right (ave.).....	2.37	3.17
Evening trials, rotation to left (ave.).....	1.79	2.44
rotation to right (ave.).....	1.88	2.40

The morning nystagmus is invariably longer, the difference being most pronounced early in the series. Additional evidence of this diurnal difference is being sought with both human and animal subjects.

3. Other responses than the nystagmus were scrupulously noted in our observations. During the first days, most of the subjects showed a tendency to excessive defecation and micturition. Frequently the feces were not of the solid character of normal life but were quite liquid, suggesting that the rotation had induced some sort of temporary organic shock. This supposition is supported by the facts that neither micturition nor defecation ever occurred late in the series and that the rats, although hungry, frequently refused to eat immediately after earlier turnings, although later they ate quite readily. Other evidence of a general organic disturbance is found in the violent trembling which frequently seized some of the rats during a given series. This trembling was distinct from that behavior mentioned before which reminds one of nothing so much as the retching of nausea in human beings. I have failed to find a single case of nausea in the rat which resulted in an esophageal discharge. The retching did not seem to occur so readily if the rat had had food before the rotational period. The trembling was by far the most characteristic performance and was common to most of the subjects. That the trembling was organically based could be determined by holding the rat just after turning. The visceral organs seemed to be convulsed. The eyes were partially closed and the vibrissae trembled violently because of the trembling of the mouth parts. This behavior occurred for two or three days after the series had been started and in the case of some of the subjects was the last observable response to the rotation:

4. It is difficult to get a quantitative test for these or for more specifically kinaesthetic responses. The only test used in this connection was an enumeration of the number of spontaneous movements made before, during, and after rotation, as the series progressed. Prior to all rotation, the exploratory movements are prominent. As rotation takes place for the first time two kinds of re-

sponse are in evidence. First, the rat may make frantic efforts to move in the direction contrary to rotation so long as the platform moves. When the movement ceases the rat turns and attempts just as vigorously to move in the opposite direction. These attempts always cease in five or six seconds: they seem to reach their term with the after-nystagmus. The other characteristic response is illustrated by those subjects which squat tensely on the floor of the rotating platform with the head turned far in the direction against rotation. There seems to be a specific inhibition of all movements and a tenseness of position leading to what one might call the "rotational posture." There is no change in the position until the end of the after-nystagmus, save that the head swings to the opposite side as rotation ceases. This second type of response can be easily induced in subjects manifesting the first kind by slightly increasing the speed of rotation. As the series proceeds, the more striking features of the rotational posture begin to drop out. The head tends to swing less and less in the direction opposite to rotation and very early the return movements—even the bringing of the head back to a straight position—disappear. Finally, the original swing itself becomes quite listless and may not occur at all provided the attention of the rat is elsewhere directed. The exploratory movements return slowly, beginning with the post-rotary period and finally entering the rotary period itself.

5. The scratch-reflex affords an excellent indication of the extensity and intensity of the bodily disturbance present during, and subsequent to, rotation. Early in a series, a scratch movement initiated before rotation is suddenly arrested as rotation begins. I have not observed any scratching during the earlier trials of a series. Subject "J" endeavored to scratch on the fourth day's rotation; but the effort was poorly localized and uncoordinated. At the end of the series, an accurately localized scratch-movement was begun and carried to completion by several subjects, and successful attempts were frequently made to cleanse the face, etc., in spite of rotation or stopping. As the exploratory movements came back to their own, the rat frequently stretched up on its hind legs. In such a position, the stopping of rotation caused a definite compensatory reaction on the part of the rat; but there was nothing here to indicate that this was more than a natural response to the effect of inertia. All of the spasmodic and uncoordinated qualities of an early event of this kind were gone. The tendency of some of the subjects to run in the direction opposite to rotation completely disappeared after a few trials. In brief, the whole series of any one of the subjects here reported displayed an increasing degree of freedom and precision of

movement, as time went on. All subjects were tested for equilibration after a series had been completed and all responded to being thrown and dropped just as alertly as before rotation.

It is hazardous to draw general conclusions from an introductory study of this kind. Our problem does, however, bear directly and significantly upon the fundamental integrity of the equilibratory mechanisms. The facts above presented support the contention that nystagmus is closely related to the other organic responses to rotation and that it is dependent, as are these other responses, upon a large group of factors. Furthermore, we have found that after-nystagmus in the white rat decreases in intensity and duration (a) from day to day and (b) within the series of a single day. Either intensity or duration may be modified also by certain organic conditions, e. g., nausea, by speed and number of rotations, and by such general conditions as antecedent rest and fatigue. The decrease and disappearance of nystagmus are accompanied by a disappearance of the characteristic rotational posture and other bodily disturbances, the disappearance being signalized by the reappearance of the usual exploratory movements and by such specific events as the scratch-reflex.

Fisher and Babcock tried to explain away the demonstrated loss of after-nystagmus under repetition (a) by charging that the human subjects were "pathological" and (b) by referring the observed decrease to a vicious practice acquired by "a few subjects" of "gaze-fixing" upon a "distant object." It is not clear just how their explanation can be extended to the white rats.

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3. FISHER, L., and BABCOCK, H. L.: "The Reliability of the Nystagmus Test," *J. Amer. Med. Ass.*, 1919, 72, 779 ff.
4. VINCENT, S. B.: "The Mammalian Eye," *J. of Animal Behavior*, 1912, 2, 249-255. See table and also references to the literature.
5. This latter method was used by the Psychological Department of the Mineola Research Laboratory. It is a decided improvement over the clinical method of observation by the stop watch. See "Manual," p. 190.
6. The semicircular canals of Rodentia are well developed and quite regular in form. See Gray, A. A., "The Labyrinth of Animals," 1907, Vol. I, pp. 165 ff.
7. See "Manual," *passim*, and also articles in the *J. Amer. Med. Ass.*, cited above.
8. Mean variations from the averages given in the tables were computed, but since they were not of sufficient magnitude to affect the significance of the figures as given they have been omitted.
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## TWO CASES OF GRADENIGO'S SYNDROME.

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The syndrome described by Gradenigo in 1904, is characterized by an acute purulent otitis media, with or without mastoid involvement; intense pain in the temporal and parietal regions from involvement of Gasserian ganglion, and paralysis or paresis of the abducens nerve of the same side as the aural lesion. Such a group of symptoms occurring during the course of a middle ear suppuration or of an acute mastoiditis, before or after operation, may occasion considerable apprehension of an intracranial complication. The cases here reported had these symptoms in more or less characteristic manner. In case one, the complication occurred two weeks after a simple mastoid operation, while the patient was making a satisfactory convalescence. Complete recovery followed without any further surgical intervention. In the second case, there was a history of an acute middle ear suppuration which had completely resolved at the time I first saw the patient, the syndrome had been present, with lessening severity, for a period of ten days; there was entire absence of signs or symptoms of mastoid involvement. A fulminant type of meningitis developed, from which the patient succumbed the following day.

*Case 1.* E. L., age, 39, came to the Manhattan Eye, Ear and Throat Hospital September 27, 1918, in the service of Dr. T. P. Berens, complaining of pain in the left ear, tinnitus and deafness of one week's duration. Previous history of aural disease negative. Examination of the left ear disclosed a moderate muco-purulent discharge from the middle ear—under tension—an inflamed bulging drum with small insufficient perforation in the posterior-superior quadrant. Slight mastoid tenderness. Temperature 99.2. Paracentesis was done. The following day the discharge was more profuse and the pain in the ear had diminished decidedly. X-ray of left mastoid showed slight shadow—no bone destruction. Patient admitted to the hospital October 1 for observation. Although the pain in the ear and mastoid tenderness had lessened appreciably, I decided to operate because of the unusually profuse discharge and indication of some sagging of the posterior-superior canal wall. Temperature at this time 100, pulse 86.

*Operative Findings.* Upon removal of the cortex, pus flowed freely from the antrum. Necrosis of inner plate over the lateral



sinus, free pus over sinus, *i. e.*, perisinus abscess present. Granulations covering sigmoid sinus. Examination of culture from mastoid showed streptococcus mucosus. Temperature normal five days after operation. Patient's convalescence was uneventful and on the twelfth day he left the hospital.

Two days later, on returning to the clinic for mastoid dressing, the patient complained of having had occasional pain, neuralgic in character, in the left temporal and parietal regions and in the left eye. The pain had begun twenty-four hours previously and had not been relieved by liberal doses of aspirin and other drugs. No chills, vomiting or other symptoms.

Mastoid wound clean and healthy in appearance. Temperature and pulse normal. The head and eye pains continued for one week, lessening in intensity and finally ceasing at the expiration of this period. Two days following the onset of the pain, the patient began to complain of double vision. This was a source of even greater annoyance than the pain. Examination of left eye movement, disclosed a decided interference with abduction. Patient was referred to the eye clinic and a report was rendered of paresis of the left abducens nerve. Other eye muscles and fundus normal. The diplopia persisted without much change for three weeks.

Two weeks later re-examination of eye muscles showed normal external restus. Wassermann reaction, negative. Mastoid wound healed in six weeks.

*Case 2.* M. L., age 31, was seen at the Manhattan Eye, Ear and Throat Hospital, service of Dr. Berens, on the 28th of August, 1919, complaining of pain over the right side of the head and diplopia. Previous history of aural disease, negative. Had influenza in March, from which he made an uneventful recovery.

*Present Illness.* About five weeks before coming to the Manhattan Hospital, the patient began to complain of severe pain in the right ear and impairment of hearing. Paracentesis was done at the New York Eye and Ear Infirmary. The patient informed me that the ear then began to discharge moderately, but the pain continued as before. The ear drum was again incised, and following this the patient's condition progressed very favorably for a period of two weeks. Pain in the right ear had ceased entirely but he now began to complain of an intense neuralgia confined to the entire right side of the head including the lower jaw. At the same time he began to suffer from a distressing diplopia. He consulted a dentist for pain in the lower jaw; a tooth was extracted but no relief obtained. Ten days before coming to the Manhattan Hospital, *i. e.*, three and one-half weeks from the onset of his aural com-



plaint, the ear had ceased discharging, pain in the right side of the head decidedly better, pain in the lower jaw no longer present, diplopia still bad.

*Examination on admission to the clinic, August 28, 1919.* Except for the paralysis of the right external rectus muscle, physical examination was negative. Right ear drum normal in appearance, no discharge or perforation. No tenderness over the mastoid—in fact the patient informed me that this had been entirely absent throughout his illness. No spontaneous nystagmus.

*Hearing.* Noise apparatus in left ear, patient hears whisper in right ear, 15 feet; left ear, 20 feet. C1, fork lateralized to right ear. Rinne negative, right ear. Temperature and pulse normal.

The above findings were confirmed by a number of other men and it was agreed that the patient could safely go home. I decided, however, to have him admitted to the hospital, more because of the fear I had of his passing from our observation, than any other reason. X-ray of mastoid, Wassermann and eye examinations were ordered. The patient's condition continued to improve and he expressed a desire to leave the hospital. I advised him, however, to remain a few days longer. Patient slept well throughout the night. Temperature normal. Wassermann, negative. *Report from eye clinic:* Paralysis of right external rectus. Other eye muscles normal. *X-ray report:* Slight shadow over right mastoid; no bone destruction.

On the evening of September 1, *i. e.*, three days from the time I first saw the patient, he began to complain of digestive disturbance and asked for a cathartic. Four hours later he suddenly became extremely noisy and restless so that morphin had to be administered. By morning he was unconscious and could be restrained in bed only with the greatest difficulty. Temperature, which had been normal all along, was now 104.2. Pulse 62 and intermittent. Respiration 30. Physical signs of meningitis present.

Patient was removed to the operating room. Before operating, I did a lumbar puncture and withdrew 10 c.c. of very turbid spinal fluid under high pressure. While operating following report of spinal fluid examination was rendered: *Chemical examination:* Sugar absent; heavy ring of albumen; marked trace of lactic acid; cell count, too numerous to count; direct smear (and later cultivation culture) *streptococcus mucosus*.

*Operative Findings.* Few drops of pus in immediate vicinity of antrum; granulations in antrum; except for few areas of pale granulations findings in mastoid proper negative. Inner plate of middle and posterior fossa and over sinus apparently normal. I then did a

subtemporal decompression, no extradural collection of pus. Exploration carried as far forward as possible. Exposure of dura posterior fossa, negative findings. The dura was then opened through the floor of the middle fossa. Iodoform drain in subdural space. A striking feature of the case, in other words, was the extremely slight degree of pathological change in the mastoid. I am led to believe that in this case, the pathway of infection was from the tympanum through the petrous pyramid and that the resulting circumscribed meningitis then suddenly developed into a diffuse form. In Case 1, the abducens paralysis and Gasserian ganglion involvement, was due, in all probability, to a toxic neuritis or local edema from extension of a mild grade of inflammation through the petrous pyramid to its tip. The majority of cases reported by Gradenigo, Perkins, Wheeler and others followed a benign course. In a considerable number of cases reported by Gradenigo either no changes or only those of a minor character were found upon opening the mastoid. Report of culture from pus in antrum showed *streptococcus mucosus*. Patient died the following morning, thirty hours from the sudden onset of meningeal symptoms. An autopsy unfortunately could not be obtained, so that we were denied the opportunity of investigating the extent of involvement of the petrous pyramid and its vicinity.

*Blood Culture.* Negative.

Aside from the presence of the syndrome described by Gradenigo, the insidious and treacherous course and the comparatively slight pathological changes in the mastoid proper, together with the type of infecting organism, are the features of unusual interest in this case.

In a comprehensive report by Dr. C. E. Perkins, of ninety-five cases of Gradenigo's syndrome collected from the literature, and reported in the *Annals of Otology*, 1910, twenty-seven appeared after mastoid operation, sixty before any operative interference and eight not stated. Of the sixty cases, twenty-nine were operated, resulting in twenty-seven cures, one death and in one case the paralysis persisted. In the remaining thirty-one cases, in which the mastoid was not opened, twenty-five recovered completely, four died and in three there was a partial recovery of the sixth nerve paralysis.

Similar results have been reported since the publication of these statistics in 1910. The reports would tend to show that abducens paralysis, *per se*, is not an indication for operation; that the degree of intensity of the pain together with evidence of insufficient drainage would point to indication for operative interference.

Although the syndrome indicates the presence of a deep-seated process, it does not follow that a mastoidectomy is necessary in

every case, for recoveries have been reported in many cases without mastoid operation or even without myrinotomy.

The explanation commonly given for the occurrence of this syndrome is that it is the result of a circumscribed serous meningitis from extension of the infection in the tympanum or mastoid to the tip of the petrous portion of the temporal; in other words, there is present an osteitis of the petrous portion. The abducens nerve is in contact with the periosteum at the apex of the petrous portion, at which point it enters the cavernous sinus, usually just external to the junction of the inferior petrosal and cavernous sinuses.

The Gasserian ganglion is in close proximity to the tip of the petrous bone, resting in a depression on the anterior-superior aspect, so that a process which would affect the abducens nerve at the tip would be likely also to include the Gasserian ganglion. In the mild types of otitis media it is entirely possible for the inflammatory process to extend to the apex of the petrous bone and to produce an edema or a local toxemia, which would readily interfere with the function of the abducens nerve and Gasserian ganglion. The petrous pyramid may be of a pneumatic character with large cells directly under the location of the abducens nerve as it enters the cavernous sinus, so that a purulent process would spread very readily to the apex.

Gradenigo classified these cases into three groups: (1) Those having typical syndrome indicated above in Case I. (2) Symptoms similar to the first group, but in addition accessory symptoms from a more extensive involvement (second, third and fourth nerve changes) or complicating lesions which may have no direct bearing upon the sixth nerve paralysis. (3) Fatal cases with diffuse meningitis.

A number of routes have been described by which the infection may reach the petrous portion from the tympanum. (a) Sublabyrinthine route: Extending from the tympanum below the labyrinth and internal auditory meatus to the petrous tip. (b) By way of the carotid canal, access to which is obtained by eroding the anterior tympanic wall or through the carotico-tympanic foramina, which give passage to the carotid branches of the tympanic plexus. (c) Infection through a layer of cells extending along the eustachian tube, thus passing from the tympanum to the petrous tip. (d) From the mastoid antrum the infection may extend through the subarcuate fossa or petro-mastoid canal, which passes inward beneath the superior semicircular canal, and reach a layer of cells lying above the internal auditory meatus and thus arrive at the petrous tip.

17 East 38th street.

## CEREBELLAR ABSCESS ASSOCIATED WITH CHRONIC SUPPURATIVE OTITIS MEDIA: OPERATION AND RECOVERY.\*

DR. J. CLARENCE KEELER, Philadelphia.

This interesting case is brought before the Laryngological Society not because of its infrequency or its successful post-operative termination, but for the lesson it so clearly serves to demonstrate.

In the history of this case, you will note the rightsided paresis to which Politzer refers in several of his cases of cerebellar abscess where paresis and paralysis occur on the side in which the lesion is situated.

Macewen of Glasgow observed paralysis of the arm on the same side in one of his cases, and Uffenorde cites a case of leftsided cerebellar abscess with cramps in the left extremities which he attributed to the reflex action of the hemisphere of the cerebellum upon the right cerebellar hemisphere.

I am reliably informed that this patient was sent to the Jefferson Hospital with the provisional diagnosis of cerebral syphilis, notwithstanding the Wassermann tests of his blood and spinal fluid were negative.

Within the past seven years he had submitted to five operations; three were for nasal defects and two for the removal of polypoids from the external auditory canal, and all without beneficial results. Whereas, we believe, had the mastoid been opened and a thorough exenteration of the disintegrated bone and the necrotic tissue been made, the sequestered labyrinth and the cerebellar abscess with their attending dangers might have been prevented.

I shall give the history of the case submitted, in full, that you may note the salient points:

J. G., age 35, an American.

*Chief Complaint.* Pain in the occipital region and back of the neck; numbness of the right side of the tongue, of the right arm and of the right leg; defective speech; vomiting without nausea; and inability to go about without assistance.

*Family History.* This is interesting only from the fact that a sister had died of brain fever, which may have had its origin in an infected ear.

\*Read before the Philadelphia Laryngological Society, December 2, 1919.

*Personal History.* In childhood he had measles complicated with purulent otitis media of the right ear. Hernia developed as a result of heavy lifting. He formerly indulged rather freely in alcoholic liquors. He denies gonorrhea and syphilitic infection.

*Present Illness.* The discharge from the right ear since childhood was recurrent in type, until 1914. Thence it has been constant and accompanied by a persistent dizziness. The severe vertigo was presumed to be due to some nasal defect, for the correction of which he was submitted to those operations previously mentioned.

In April, 1919, prior to his admission in the hospital, the patient was stricken with paralysis of the muscles of the right eye, the right side of the face, the right side of the tongue and of the right leg. The right arm, apparently, was not involved.

April 22, upon his admission to the hospital, the examination showed the paralysis had left him, but he was suffering from severe headache, pain over the back of the neck, a peculiar enunciation and the old discharging condition of the right ear. The left ear, the eyes, the nose and throat, the heart, the lungs and the abdomen were negative.

The examination of his mouth showed much infection and the very poor condition of his teeth. His tongue was coated and it protruded to the mid-line and was without tremor. The face is asymmetrical. The extremities show some muscular atrophy of the right leg. The knee-jerks are the more marked on the right side. Babinski for the right foot. The urine is normal. The Wassermann blood and spinal fluid tests were negative. The cell count is 4. Sugar is present.

One week after admission the eyes showed the tension and the muscular balance to be normal; the media is clear, the disc margins are slightly blurred; the veins are full but not tortuous; the retina is clear.

The roentgenogram of the right mastoid shows the mastoid to be of the chronic sclerotic type with a bone defect in the antral region communicating, apparently, with the meatus.

The oto-neurological examination showed that the right labyrinth and the eighth nerve are dead.

There was spontaneous nystagmus in the four directions, *i. e.*, right, left, up and down.

The spontaneous past-pointing three inches to the right from above down and from below up and two inches high up by the inward lateral shoulder movement with the right arm, finger-to-nose is very ataxic. He falls backward and to the right. Romberg is double plus. He cannot stand or walk without assistance.

Stimulation of the horizontal semicircular canals by rotation showed he was unable to past-point inward with his right and left arm. This indicates involvement of the inward pointing center of the right arm in the right cerebellar hemisphere, and the inward pointing center of the left arm in the left cerebellar hemisphere, which is apparently involved by pressure.

I greatly regret that the vertical canals could not be tested, as the patient's headache had, by this time, increased to a degree almost beyond endurance. Furthermore, the right external auditory canal was filled with extensive polypoids and hence the irrigation would not have been successful.

It is reasonably clear that the patient is suffering with a cerebellar involvement, because of the continued and severe occipital headaches, the projectile vomiting, and the distressing vertigo. The spontaneous nystagmus, the past-pointing, the falling backward and to the right, the marked incoordination of the arms and legs (especially the latter), the interference with the inward pointing centers of the right and left arms, the temporary rightsided paresis, all in conjunction with the extensive chronic suppuration of the right ear favors a cerebellar rather than a cerebral abscess.

The patient is growing weaker as shown by his general condition. There is frequent vomiting, and the head and neck pains persist.

On May 3 an operation was performed. This was a radical mastoid of the right side with evacuation of a cerebellar abscess. The entire mastoid contained cholesteatoma and granulations. The pus was found to ooze from the cerebellar region, posterior to the course of the facial nerve. The promontory and the ossicles of the middle ear are obliterated. The tympanum is filled with numerous polypoid growths. One large growth is best described as extending through the external auditory canal and being attached in the location of the oval window. Fully half an ounce of pus is drained from the cerebellum. Apparently, it is the pus from this abscess that passed from the external auditory canal. The facial nerve, exposed by the necrotic erosion, is easily hooked up and demonstrated. This manipulation of the nerve caused some muscular twitchings of the face. The labyrinth appeared in the wound as a sequestrum and could have been removed except for its attachment to the facial nerve. The lateral sinus had become obliterated. The obliteration of the sinus I have demonstrated in other cases.

*Post-operative Notes.* There is slight facial paralysis. You recall, no doubt, the asymmetrical condition of the face from a prior facial nerve irritation. The speech has fully recovered and he is entirely free from his severe headaches. The inward pointing cen-



ters of the right and left arm have assumed their normal functions; and the spontaneous past-pointing, the nystagmus and the falling reactions are no longer present.

It is interesting to note that his temperature, from the time of his admission to the hospital and all through the four months' convalescence to within about a week of his discharge, ranged between 97° and 98°.

In conclusion, I shall refer briefly but most emphatically to the shameful lack of recognizing the association of ear diseases with those of the intracranial structures; as an early recognition or a correct interpretation of the various attending symptoms might avert, in a vast number of cases, the full dangers pertaining thereto.

Our best guidance for the prevention of intracranial complications is the early drainage of the middle ear and of the mastoid in the acute stage. This is especially true if the infection does not promptly respond to the usual methods of treatment. And it is my firm conviction that this case and many similar chronic infections of the middle ear and of the mastoid have originated in the neglected or the unrelieved acute infectious diseases of childhood.

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#### A NEW METHOD FOR CLOSING OFF THE EUSTACHIAN TUBE IN THE RADICAL MASTOID OPERATION.

DR. ALFRED KAHN, New York.

The instruments consist of three Eustachian reamers fashioned somewhat after the type of the Eustachian reamers described in *THE LARYNGOSCOPE* of March, 1919.

*Technique.*—The usual radical mastoid cavity is made, then the Eustachian tube is curetted out and enlarged with the reamers, after which a skin graft is inserted deep into the upper end of the Eustachian opening, according to the technique and with the skin graft instruments described in *THE LARYNGOSCOPE* of December, 1918. The rod, however, therein described upon which the graft is carried is extremely small in diameter so that it can easily pass into the Eustachian opening. The graft in healing attaches itself and the Eustachian opening is firmly closed.

50 East 42nd St.



## BRAIN ABSCESS AS A COMPLICATION OF ACUTE INFECTION OF NASAL ACCESSORY SINUSES.

DR. L. W. JESSAMAN, Framingham, Mass.

The following case occurred in one of the British hospitals in France to which the writer was at the time attached and is reported because of some points of interest in its course and the subsequent autopsy findings.

*Case Report.* Patient was admitted to the hospital with a diagnosis of influenza and was treated on the Medical Service for two weeks. He was then referred to the writer because of persistent pain, in spite of medical treatment, in the left frontal region and about the left eye.

*Examination.* Tenderness over left frontal sinus and anterior ethmoid cells. No swelling. Right nares negative, except for some congestion of the mucous membrane. Left nares showed congestion of mucous membrane and thick pus discharging from beneath the middle turbinate. Eyes negative. Reflexes normal.

Operation was advised to secure better drainage. This was done the next morning under local anesthesia. Part of the left middle turbinate was removed and the ethmoid cells exenterated.

The next day the patient was feeling very much improved; not as much pain and less tenderness over sinuses.

On the second day the patient's condition was good in the morning but in the afternoon the temperature rose to 104°. The patient said that he did not have much headache but complained of severe pain in the legs. Reflexes normal. Eyes negative. Chest negative.

For the next two days the patient seemed to be improving and had very little pain. Some pus discharge from nose continued. The fifth day after operation he had some trouble in talking in the afternoon, but this speech difficulty had all disappeared the next morning.

On the seventh day there was again some trouble with speech in the afternoon.

White blood count, 18,000.

The next morning there was motor aphasia, marked paresis of right arm and almost complete paralysis of right hand, paresis of the right abdominal muscles and right leg. The tongue did not deviate from the midline.

Examination of the eyes did not show any optic neuritis.

It was now very evident that we had a brain lesion, and the most probable source of the infection seemed to be from the frontal sinus.

The patient was sent to the operating room for operation on the frontal sinus. Before beginning operation lumbar puncture was done. Spinal fluid clear.

*Operation.* Under general anesthesia the frontal sinus was opened. It was filled with pus and the mucous membrane degenerated. The anterior wall of the sinus was entirely removed. The posterior bony wall appeared normal, except a small area at the lower part. The posterior wall was also removed. The dura was not under pressure and the incision did not show any pus underneath. The brain was explored and a small amount of pus evacuated from a point about one inch in depth upward and backward. A drain was placed at this point. The skin wound was only partially closed.

The following day the patient could use the right hand and arm very much better, but the aphasia was unchanged. The eyes now showed a little congestion of the optic discs.

Bacteriological report on the spinal fluid, and pus from the frontal sinus and from the brain were all negative. Smears were negative and there was no growth on cultures.

Lt. Col. Gordon Holmes, Neurological Consultant for the British Expeditionary Forces, saw the patient at this time. He believed there was an abscess in the white matter of the brain pressing upward on the cortical centers and advised further exploration.

*Operation.* A large amount of bone was removed from over the frontal lobe. Pus was pressed out of the previously made opening in the dura. This opening was enlarged and a very large sub-dural abscess found. Pus also was discharging from the brain. A rubber drain was placed under the dura and the scalp incision was partially closed.

Following this operation there was a profuse discharge from the brain abscess. Paralysis of right arm and leg became complete.

Patient died six days after the last operation.

*Autopsy.* At the upper part of the cortex of the right frontal lobe was a small area of softening. Otherwise the right hemisphere was negative.

*Left Hemisphere.* Dura thickened. Entire surface covered with thick pus. A large amount flowed from between the falx cerebri and the hemisphere. The dura over the ethmoid was very much thickened. No pus was found between the dura and the bone. The bone over the ethmoid was intact but very much discolored. It was necrotic and easily broken through. There was no pus in the ethmoid as it was well drained. There were no undrained pus-pockets in the brain.

The writer does not know whether this patient had any sinus involvement when admitted to the hospital or not, as he was not called in consultation until two weeks later. At that time the symptoms did not indicate brain involvement.

The intranasal ethmoid operation improved the drainage so that the symptoms were much ameliorated.

There were no symptoms definitely pointing to a brain lesion until the onset of aphasia. The aphasia which occurred on two days was difficult to explain because it was so transitory, but the occurrence of permanent aphasia and paresis definitely indicated a brain involvement.

Operation, at this time, on the frontal sinus, which was found filled with pus, made it seem most probable that the brain had become infected from this source and the writer would have continued to have believed that he had made a mistake in not operating earlier on this sinus had not the subsequent autopsy findings showed the real point of invasion to have been from the ethmoid.

It is probable that if this patient had been seen earlier and the ethmoid drained the brain infection might have been averted; at least extension would not have been as liable to occur.

With the communications between the nose and brain by way of the blood vessels and along the olfactory nerves and with only a thin plate of bone separating the frontal, ethmoid and sphenoid sinuses from the brain, it is surprising that nasal and accessory sinus infections are not more frequently complicated by cerebral lesions. It is undoubtedly true that this does occur much more frequently than we are led to believe from the literature, as there is great difficulty in obtaining autopsies in civil practice, and there is too great reluctance to publish reports of cases which cannot be classed as successes.

The treatment of these brain lesions is chiefly by prophylaxis; that is, by early and adequate treatment of the sinus infection. Whether the treatment of the sinuses is to be conservative or radical must depend upon the indications present in the individual case. When the brain has become involved from these sources the prognosis is poor. There are two chief reasons for this: One is the fact that the point of invasion of the brain is in the so-called silent areas, and there are no localizing symptoms sufficient to make a diagnosis until the disease has progressed so far that it cannot be stopped by surgical means. The other factor is that, except in the case of the frontal sinus, even if an early diagnosis is made, it is extremely difficult to secure adequate drainage and prevent extension of the process.

60 Concord street.

## TUBERCULOSIS OF THE LARYNX.

DR. HUGO KUNZ, New York.

It is conceded by almost all observers of the present day that tuberculosis of the larynx is secondary to phthisis or tuberculosis of the lung, and while a small proportion of cases appear to occur primarily in the larynx, the early symptoms of pulmonary involvement and the extensive amount of lung tissue affected as shown by the X-ray findings has dissipated any notion that the affection is ever a beginning laryngeal condition.

The mucous membrane of the upper respiratory tract is very vulnerable against the invasion of the tubercle bacilli in contradistinction to the lung tissue, which offers a fertile field for the growth and development of these germs. The evidence thus far is overwhelming in considering the lymphatics and blood vessels responsible for the carrying of the bacilli to the larynx from the lung and setting up the process here as a secondary affection.

*Case 1.* J. M., barber, age 30, called at my office January 28, 1917, complaining of hoarseness and a dry irritating cough of one month's duration. Examination of the larynx revealed marked enlargement of the left arytenoid cartilage with a small area of ulceration at the edge of the epiglottis. The case was diagnosed as a tubercular process. I did not see him again until February 11 (two weeks later), when I was called to his home. He then complained of severe pain in the left axillary region and appeared to be quite sick. Dr. Max Taschman saw him the following day and diagnosed the case as a tubercular lesion of the left upper lobe complicated with pleuritic involvement of the same side, also slight involvement of the right upper apex of the lung. The patient gradually recovered and spent the spring and summer of 1917 in the Catskill mountains. He came back in October and called at my office, his laryngeal condition entirely healed, cough gone, but with a large cavity in the upper left lobe. He had gained 17 pounds and has been well ever since.

The first symptom of laryngeal trouble is that of hoarseness or huskiness. This does not always mean that the larynx is already involved, as in many of these cases, as pathological changes in the larynx have taken place; the hoarseness being due to the dryness of the throat and the continued cough incident to the pulmonary

involvement. Later on there is aphonia, painful deglutition and dyspnea; the shortness of breath, however, being due in a majority of cases to the amount of lung tissue affected rather than the laryngeal lesion. Cough and expectoration are due to the pulmonary affection, but blood-stained expectoration is often caused by ulceration of the larynx.

The appearance at first may not be pathognomonic of the disease. The larynx may be reddened and the vocal cords congested and thickened as in a subacute or chronic laryngitis. More often the larynx is pale and of a grayish color with the cords lax and flabby and possibly nodular; this appearance being highly suggestive of a tubercular condition. Ulceration of the epiglottis or ventricular bands, no matter how slight and superficial, would stamp the case as one of tuberculosis. Miliary tubercle scattered under the mucous membrane, ulcerations of the ary-epiglottic folds, and club-shaped thickening of one or both arytenoids due to a chondritis or perichondritis of these structures are all pathognomonic evidences of a tuberculous lesion; so also is the thickened turban-shaped epiglottis and the presence of wart-like growths in the inter-arytenoid space presumptive signs of the affection.

Later on, destruction of the cartilages with abundant secretion accompanied by aphonia and dyspnea on exertion with a corresponding involvement of lung tissue and cavity formation evidences the terminal symptoms of this unfortunate disease.

*Case 2.* S. G., male, age 51, real estate agent, was referred to me January 31, 1918, by Dr. L. Kunz. He had been hoarse for six months past. On examining the larynx both arytenoids were found enlarged and ulcerated, with ulcerations in the inter-arytenoid space. Sputum examination, February 3, was positive. This patient was seen by Dr. Taschman, who reported tuberculosis of lungs with cavity of right upper apex. His condition at that time was not so bad and he left New York for Asheville, N. C., in March, 1918. After a stay of ten weeks, however, he was compelled to return to the city, having been confined to his bed most of the time. He grew rapidly worse and died soon thereafter.

The diagnosis of tuberculosis of the larynx is not always an easy one. Frequently, however, the laryngologist makes the diagnosis before any pulmonary signs manifest themselves; after which a more painstaking examination of the chest with X-ray findings and sputum tests establish the diagnosis beyond a doubt. Thorough and frequent examinations of the larynx in a case of hoarseness lasting ten days or over in youthful patients is therefore imperative so that

a diagnosis may be arrived at. In the advanced cases, gummatous ulcerations may be mistaken for tuberculosis in this situation. Syphilitic ulceration is more deep and extensive and more rapid and destructive in its action than tuberculosis ulceration. In these advanced cases and indeed in every case of ulceration of the larynx a Wassermann should be made in the hope that the condition may be luetic and not tubercular, as anti-luetic treatment in syphilis of the larynx produces magical results, whereas tuberculosis, accompanied by marked pulmonary disease with cavity formation is hopeless.

*Case 3.* Emil M., male, age 36, laborer, was referred by Dr. Fidler, December 1, 1918. He gave a history of lues with a 4 + Wassermann. His initial lesion dated some ten years back. His present symptoms consisted of hoarseness and painful deglutition. Physical examination showed marked swelling of both arytenoids, congestion of both vocal cords, and ulceration and edema of the left ary-epiglottic fold, resembling a tuberculous condition. Examination of his chest and an X-ray of his lungs were, however, negative. On anti-luetic treatment his condition rapidly improved, and except for a slight huskiness, due to a thickening of his vocal cords, he has entirely recovered.

In not a few instances both tuberculosis and syphilis of the larynx have existed in the same individual, making a Wassermann test imperative in all these cases. Carcinomatous ulceration of the larynx is a condition which may be mistaken for tuberculosis in this situation. It is, however, rare before the forty-fifth year, according to all reports, and indeed rare before sixty. It begins unilaterally in contra-distinction to tuberculosis and in all cases microscopical examination should be made of the cauliflower excrescence to establish the diagnosis. Lupus ulceration may also be confounded with tuberculosis. It rarely occurs alone, however, in this region: ulcerations of the face and nose and possibly throat accompanying the lesion in the larynx. It is very destructive and fortunately exceedingly rare.

An interesting case came to our attention in the Nose and Throat Division of the Lenox Hill Dispensary about a year ago. The patient, a baker, who was a man about thirty-five, looked sallow and emaciated and complained of dysphagia, hoarseness and cough. Thorough cocaineization of his pharynx and larynx had to be made before inspection of his larynx was possible. The epiglottis was swollen and edematous with moth-eaten ulcerations of the right area. The right vocal cord was ulcerated and immovable. Both arytenoids were markedly enlarged so that inspection of the chink



of the glottis was exceedingly difficult. He had a 4 + Wassermann and an X-ray of his chest showed marked enlargement of the chain of glands along the trachea and mediastinum, undoubtedly tuberculous in character. There was no expectoration so that a sputum examination could be made. The patient unfortunately passed from our notice, but a diagnosis of lues with tuberculosis was unquestionably justifiable in this case.

The prognosis of tuberculosis of the larynx is entirely dependent upon the pulmonary involvement. If the latter condition is amenable to treatment and improvement follows, the former condition will also improve. So also does the treatment of these cases follow in the same wake. Whatever treatment is of benefit to the lung condition is also beneficial to the laryngeal involvement, and in this connection climatic treatment ranks first in importance in the early cases. High altitudes and residence in mountainous regions offer the best means at our command for the cure of these cases. Even advanced cases are beneficially influenced by a sojourn in these high altitudes. 3,000 to 5,000 feet above sea level, providing circumstantial conditions permit, is a haven of cure for these unfortunates. In no other conditions does climatic influence play so important a role. Applications of caustic agents such as nitrate of silver, lactic acid, and galvano-cautery are all of secondary importance compared with high and dry fresh air in the early stages. Later on in the advanced and hopeless cases we can only relieve the distressing symptoms as they arise. Opiates are required in most cases. Spraying the larynx with a 2 per cent solution of cocaine before meal times may be necessary to enable the unfortunate victim to swallow solid food where dysphagia is present. Extirpation of a portion of the larynx may become necessary where dyspnea is a pronounced symptom. As a rule, however, the patient succumbs to his pulmonary lesion before such a heroic measure has to be undertaken.

Riverside Drive and 141st street.



## INCOMPLETE MASTOID OPERATION AS A CAUSE OF DELAYED HEALING.

DR. FREDERICK THAYER HILL, Waterville, Me.

The simple mastoid operation as today performed causes no great concern to the competent otologist. The triad of danger points so terrifying to the neophyte—through experience and training—prove no barrier to operation. With the diagnosis established and operation indicated there is usually no hesitancy in regard to operative procedure. By avoiding undue delay the percentage of complications encountered is reduced and hearing conserved to a greater extent.

What then, is our weakest spot in this branch of surgery? With diagnosis for the most part easily established and operation devoid of its terrors, it would seem that the too often extended period of convalescence and the too frequent failures necessitating secondary operation are fields for criticism. Far too often, compared to other fields of surgery, does the post-operative period drag out ten, twelve or more weeks and, then, further operative interference is required to insure healing and a dry middle ear. In the clinic of the civilian hospital this is often lost sight of, for the case is discharged to the out-patient department long before it is completely healed and the dressings are carried on there by someone other than the operator. The experiences in a military hospital have proven a revelation in this respect for the patient could not be discharged until the mastoid was healed and the man able to perform the full duties of a soldier.

We may consider five or six weeks as good time in which to get complete recovery, but how often do we fail miserably in this respect? Surely there must be some reason for this lapse—why some cases go on to a rapid and uneventful convalescence and others, apparently just as favorable at operation, lag so discouragingly.

A case that drags along unduly after operation must be considered in the category of failures, since we are confronted with what is really a case of chronic osteo-myelitis, with its liability of complications, something we hope to avoid after thorough surgery. We endeavor to preserve the hearing by means of the simple mastoid operation, but with a long continuation of the suppurative process in the middle ear there is bound to be a loss in this respect.

Under the heading of failures are grouped those cases—both excusable and inexcusable—resulting in: (1) Death; (2) Complications, whether requiring operation or not; (3) Extended post-operative period, whether requiring further operation or not.

The first two subdivisions may be really considered together, for it is indeed safe to say that a case does not die of mastoiditis *per se*. The lethal blow is dealt by some complications, such as sinus thrombosis and resulting general sepsis, cerebral or cerebellar involvement, or some metastatic process; meningitis or brain abscess.

The condition of the middle ear and mastoid at the time of operation must be considered. In this discussion we will disregard the case where operation was obviously too long deferred, or where there was a chronic suppurative otitis media and similar extenuating circumstances. Given an acute mastoiditis in an otherwise healthy individual, operated upon in what was considered due time, why should there be any unduly extended period of healing?

Three factors enter into this question: (1) The resistance of the individual; (2) the virulence of the infection; (3) the character of the operation.

As we are chiefly concerned with the otherwise healthy individual the first factor need not be considered to any marked extent. The fact that syphilis, tuberculosis and other general diseases retard healing is far too often an easy and plausible excuse, used to palliate one's conscience in the case of delayed healing. Debilitation of the patient from long continued sickness may play a most important part in convalescence. Uncinariasis may be a factor. The condition of the naso-pharynx, the presence of adenoids, diseased tonsils, deviated septa and accessory sinus infections and their well-known relation to the delayed resolution of the middle ear must indeed be considered. But, if in the otherwise healthy patient we try to place the blame for non-healing on the individual's poor resistance, in the majority of cases we will be sadly in error.

The virulence and type of the infection plays a somewhat larger rôle, though here again we must take care not to find ourselves hunting for an excuse for our own surgical shortcomings. We encounter a series of acute mastoids within a certain period of time and, as far as laboratory findings can indicate, of a similar infecting organism. These same cases will vary markedly in their post-operative response in a way unexplained by the nature or virulence of the infection.

By far the leading factor seems to be the character of the operation. It is unnecessary to consider the incomplete so-called mastoid operation of the untrained operator. We are concerned with the modern simple mastoid operation, the more, or less thorough extenteration of the mastoid process.

As commonly considered there are four types of mastoids: (1) Pneumatic; (2) diploetic; (3) diplo-pneumatic; (4) sclerotic.

This last is considered by most authorities a pathological type. It is almost never encountered in the class of cases here discussed. Cheatle objects to the use of this term "sclerosed" or "sclerosis," maintaining that this type is a persistence of the infantile; that in the infantile the "mastoid mass" is either diploetic or dense, and in some cases persists as such in the adult without the formation of air-containing cells from the antrum. Whatever the process, what we are concerned with in this discussion is the type of case in which there is a varying amount of either diploetic bone or dense mastoid mass, associated with an acute mastoiditis.

Poltzer gives the occurrence of these in the following ratio: Pneumatic, 37 per cent; diploetic, 20 per cent; diplo-pneumatic, 42 plus per cent; sclerotic (scattering).

In the average clinic they will occur in about this ratio. This is true of the cases from the clinic at U. S. General Hospital No. 14, upon which these observations are based.

The pneumatic mastoid following operation seems generally to rejoice in a shorter and more uneventful period of convalescence than in the other types. Secondary operation is much less frequently required. The cases tardy in healing and those reverting to the operating table are more often found among the diploetic and diplo-pneumatic types. Out of a series of 168 simple mastoids at U. S. General Hospital No. 14, in which the ratio given by Poltzer was pretty consistently borne out, there were sixteen cases which came to secondary operation after a long drawn-out period of post-operative treatment. Of these sixteen cases, two were of the straight pneumatic type, five diploetic and nine diplo-pneumatic.

It is fair to presume a greater degree of success for the primary mastoidectomy in the pneumatic type, for the average aural surgeon will not consider his operation complete until he has followed out every cell and pretty thoroughly exenterated the mastoid, removing all possible foci for recurrence, or continued suppuration. In some cases, with cells extending forward into the root of the zygoma and over the external auditory meatus even to the tempero-mandibular

articulation, or upward and backward into the occipital there may be considerable difficulty, but with the help of the radiograph a thorough exenteration is usually accomplished. In the two pneumatic mastoids mentioned above, the operators in each case frankly failed to reach all the cells and reoperation was necessary.

In the diploetic and diplo-pneumatic types we have a different condition to deal with. The operator upon reaching what he feels is solid, sound bone, is apt to consider discretion the better part of valor and stop before completely exenterating the mastoid. In the majority of cases he wins out and the mastoid heals in a varying period of time, but from our observations, in about 12 per cent of the cases reoperation is necessary. The diploe may contain quite as much potential trouble as the cells of the pneumatic type. Unless the mastoid is completely cleaned out to its boundaries we may have a condition simulating a chronic osteo-myelitis, resulting in at least an extended period of healing and possibly requiring further operative procedure.

Let us consider the mastoid as a collection of cellular or diploetic, or dense bone; a matrix, surrounded by the cortex corresponding to the outer table of the skull and on the internal aspect by the plates of the inner table. It is posterior to the hard bony external meatus wall and anterior to the plate covering the lateral sinus. Above is the plate forming the floor of the middle fossa. The cortex of the mastoid surrounds this at the tip and encroaches inward and upward, forming the prominence of the groove for the insertion of the posterior belly of the digastric muscle. This cellular or diploetic matrix sometimes extends into the substance of the petrous portion.

As the lateral sinus bends forward and downward, forming the so-called knee, it makes an angle with the floor of the middle fossa above. Sometimes this angle is very acute and the space within it very narrow, with consequent temptation on the part of the operator to overlook this, especially if solid. Doing so may be a cause of continued suppuration and necessitate a secondary operation later. Frequently as the sinus swings downward, inward and slightly backward below the knee before making its exit through the posterior lacerated foramen, there is another angle or space formed between its plate and the prominence of the digastric groove. This is frequently overlooked in operating, the surgeon making a beautiful excavation to the tip from the plate covering the sinus but neglecting to dissect out this important angle. This is a favorite site for a perisinus abscess.

Too many mastoid operations may be likened to sweeping a room without touching the corners. These corners or boundaries of the mastoid should be thoroughly cleaned out to insure healing. Whether pneumatic or diploetic or a combination of the two, the zygoma, the cells or diploe just posterior to the external auditory meatus, the tip, and the angles between the sinus and the floor of the middle fossa and the sinus and the digastric groove should be as thoroughly exenterated as possible. Leaving these points should no more be thought of than of neglecting to open the antrum. The cases requiring secondary operation all showed one or more of these points neglected at the first operation. For the most part, after cleaning these out thoroughly the cases went on to a rapid and uneventful convalescence. One case showed at the second operation an area of necrotic dura where the angle between the sinus and the floor of the middle fossa had been overlooked. He exhibited marked signs of cerebral irritation, soon meningitis developed and death ensued on the third day. Post mortem examination revealed an abscess of the temporo-sphenoidal lobe. Three cases developed sinus thrombosis. In one the space between the sinus and the digastric groove had been overlooked; in another, the angle between the sinus and the floor of the middle fossa, and in the third both of these places had been neglected at the first operation. A perisinus abscess was found in each case at the neglected point.

In this series of secondary operations four cases presented incomplete exenteration of the zygomatic area; two, of the posterior meatal area; one, of the tip; eight of the superior angle between the sinus and the floor of the middle fossa; and nine, of the space between the sinus and the digastric groove.

These observations are based upon the work of the oto-laryngologic staff at U. S. General Hospital No. 14, which, because of its connection with the School of Oto-laryngology, Medical Officers Training Camp, Camp Greenleaf, was quite large and of constantly changing composition. The operators were men of training and experience, from various parts of the country and may be well considered as typical of the otologists of the country. As a rule, due to this constant change of personnel, the secondary operation was usually performed by someone other than the original operator. In this way possibly franker and more unbiased criticism was obtained. In practically every case the after-treatment, at least the immediate care, of the case was handled by the operator so that the question of the proper conduct of the case from the operator's point of view can be largely discounted.

In these cases which came to secondary operation, undoubtedly, the original operator cleaned out all soft and necrotic bone and felt that he had reached the limits of the mastoid. But diploetic or dense bone was left, as shown by the later operation, in each case. This diploetic bone, while apparently healthy at that time, contained potential trouble, suppuration continued and later this area became frankly diseased. In no case where the mastoid was completely exenterated, care being taken to outline the sinus and the boundaries of the mastoid cavity, whether pneumatic or diploetic, was secondary operation required. It was not deemed necessary to uncover the sinus itself but simply to outline the dense bony plate covering it. Where this was eroded, as in a perisinus abscess, the course pursued was obvious. These cases healed rapidly and went to duty in from four to six weeks. The middle ear would be dry in from two to five days, as a rule.

The method of after-treatment employed seemed of minor significance. The Carrel-Dakin and the dichloramin treatment was tried on a number of cases but without startling results. The main factor seemed to be the character of the operation. By far the best results were obtained in the cases which had a thorough exenteration regardless of type and in which the after-treatment largely consisted of "scientific neglect." A clean operation followed by lightly packing the cavity with either plain or iodoform gauze for about five days, after which the packing was pretty much eliminated except for light wicks to the antrum for a few days, offered the best results.

Sometime ago I had occasion to operate upon a mastoid which had persistently refused to heal. The man had had two previous mastoid operations performed by two different operators, the first eight months before and the second four months before. While the middle ear was perfectly dry and had resolved, the wound had not closed but was discharging and bare bone could be felt with a probe. There was no constitutional disease of any kind and the patient was in otherwise perfect health. The mastoid was of the diploetic type. It had been fairly well exenterated except for the angle between the sinus and the floor of the middle fossa. The continued necrotic process had exposed the dura over the middle lobe for an area about 4 mm. in diameter, upon which was a small bit of granulation tissue. The angle was thoroughly curetted out and the plate covering the dura was removed until normal dura was found. The mastoid healed in good time, considering the duration of the process and its consequent devitalization, convalescence was uneventful, and the man went to duty in about eight weeks.



The pathologic changes in acute mastoiditis, according to Beck, occur in two ways: (1) Cell route or confluent mastoiditis, and (2) vascular or osteophlebitic mastoiditis. In the diploetic, or dense mastoid, it is more probable that the infection takes place by the latter method. This would explain the necrosis taking place after the first operation, when the area in question appeared perfectly solid, much more readily than the confluent process, especially where ample drainage has been established. However, neither this, nor the question of whether the infection reaches this area after operation as a factor of the continued suppuration, or is already there, possibly latent, is of greatest importance. The main thing is that this same area of diploetic or dense bone may be the cause of continued suppuration in the mastoid cavity, possibly requiring secondary operation or resulting in untoward complication and therefore care should be taken to thoroughly exenterate this, outlining the boundaries. Often this is exceedingly difficult to do, for we may encounter a mastoid in which there is what simulated an inner plate but what is really a dense partition in the mastoid mass and having small cells or diploe underneath. As pointed out by Bigelow, the radiograph may be of the greatest possible assistance in gaining a conception of the extent of the cavity, stereographic plates being of especial value. However, if operation is not deemed complete until the solid inner plate, or its underlying substance if absent, is reached and the boundaries outlined, especially in the angle between the sinus and the floor of the middle fossa and in the space between the sinus and the digastric groove, our efforts will be crowned with a greater percentage of success.

#### CONCLUSIONS.

1. The period of convalescence is mainly dependent upon the character of the operation. This is generally the cause for delayed or non-healing mastoids. Early healing and uneventful convalescence depends upon thorough exenteration.
2. Cases of delayed healing and requiring secondary operation are met with more frequently in the diploetic and diplo-pneumatic types, where there is a persistence of the diploe or "dense mastoid mass."
3. The cause of this is neglect upon the part of the operator of certain areas, this oversight being less likely to occur in the cellular mastoid.



4. The "favorite points" overlooked are: the angle between the sinus and the floor of the middle fossa, the space between the sinus and the prominence of the digastric groove, and less frequently, the zygoma, posterior meatus wall and the tip.

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**Report of a Case of Meningitis Following Operation Upon the Middle Turbinate, with Autopsy Findings Showing an Old Perforation of the Cribriform Plate of the Ethmoid.**

T. J. HARRIS, *Ann. Otol., Rhinol. and Laryngol.*, 1919, xxvii, 1241.

Harris reports a death from pneumococcic meningitis at Fort Oglethorpe following the removal of a cystic middle turbinate by means of the cold snare. The patient gave a history of having sustained a fracture of the nose twelve years before which had incapacitated him for two weeks at that time but had caused him no trouble since.

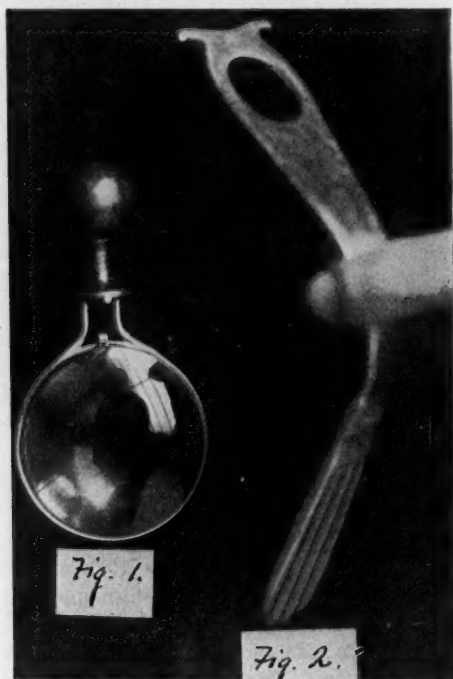
The diagnosis made on microscopic examination of the tissue removed at operation was acute phlegmonous rhinitis superimposed upon chronic hypertrophic rhinitis. The postmortem findings showed that the contributory cause of death was operation upon cystic degeneration of the middle turbinate complicated by failure in the formation of the cribriform plate of the right ethmoid bone on the side operated upon.

When the brain was removed it was noted that the anterior lobe of the cerebrum was adherent to the cribriform plate of the ethmoid of the right side. The fact that some of the brain structure was torn in the removal indicated that the condition was chronic. In the middle portion of this cribriform plate was an opening 5 mm. in diameter with a necrotic center. This necrosis included the dural covering. In the opinion of the pathologist there was little doubt but that the perforation in the plate had existed since the time of the injury twelve years before and that there was probably a direct communication between the cystic turbinate and the brain.

## NEW INSTRUMENTS.

DR. SALTAN MCGIBBON, Edmonton, Canada.

No. 1—*Magnifying Lens with a Special Handle.* The lens for focal illumination of the eye is provided with a knob-shaped handle so that it may be held either between the second and third or the third and fourth fingers with which it can be freely moved, at the same time allowing freedom of the other fingers so that the two hands become available for manipulation.



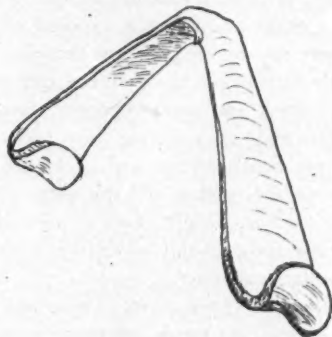
No. 2—*Combination Tongue Depressor and Pillar Retractor.* The usual tongue depressor is so made that its end is expanded into two blunt, hook-like processes. It is very useful for inspecting the fossae after removal of the tonsils to detect small remaining pieces; it is still more useful in cases of hemorrhage where one wishes to clamp the bleeding point with an artery clamp. This allows one to hold the tongue down and at the same time retract the pillar with the left hand, leaving the right hand entirely free to swab the parts and apply the clamp.

## AN ADENOIDOSCOPE OR SOFT PALATE RETRACTOR.

DR. ALFRED KAHN, New York.

The removal of adenoids, in the dark as it were, has never greatly appealed to me. The idea of placing an instrument in the post-nasal region and scraping, cutting or biting without having this locality under the eye, has appeared to me crude. Having this object in mind, I am herewith presenting a new instrument for the consideration of workers in this line. The instrument is, in short, a simple curved tongue depressor, curved up at each end as per illustration.

*Technique.* The patient is under an anesthetic, with mouth gag in place. The tongue is then depressed with the flat side of the instrument until the instrument held in the left hand hooks in back of



the soft palate, drawing it forward, thereby exposing the post-pharyngeal region. The adenoid removing instrument, held in the right hand, enters the mouth simultaneously with the adenoidoscope and the inspection or operation is carried on directly under the eye. If it is desired to retract the soft palate with the convenience of holding the instrument upward, the adenoidoscope is reversed, and the soft palate is retracted by the hook on the opposite end of the instrument. This instrument is particularly useful for the purpose of controlling hemorrhage after the adenoid operation.

50 East 42nd Street.

## LUPUS OF THE UPPER AIR PASSAGES.\*

DR. RUSSELL WEBBER, Edinburgh, Scotland.

The greater number of cases occur in females (77 per cent). It is during the second and third decades that the majority of the cases has been noted, as follows: First decade, eleven cases; second decade, forty-one cases; third decade, thirty-four cases; fourth decade, twenty-one cases; fifth decade, nine cases; sixth decade, nine cases; seventh decade, three cases.

*Lesions of the Nose.* When first seen the patient, as a rule, complains of a blocking of one or the other side of the nose. Examination shows a certain amount of crushing on the area affected. This is usually the anterior end of the inferior turbinate, the angle formed by the septum and outer wall, or an area on the septum about half an inch posterior to its anterior free margin, or reaching its junction with the skin. When the crust is removed a pinkish, elevated, granular surface is exposed which bleeds easily. As the disease progresses and the perichondrium is attacked the septal cartilage frequently becomes perforated, the soft parts of the nasal vestibules are infiltrated, and unless checked, complete destruction of the alar cartilages and skin covering them takes place. The area in the nose most frequently overlooked is the small space formed by the angle between the septum and the outer nasal wall.

*Lesions of the Tear Sac.* Eight cases in the series. The disease began within the nose and probably spread by direct extension along the mucosa of the lacrimal duct.

*Lesions of the Alveolus, Hard or Soft Palate and Uvula.* Thirty-three cases in the series. As a rule the mucous membrane presents a more granulous appearance than in the other regions affected. The lesions may be discreet, pale pink elevations about the size of a pinhead, scattered about with no definite grouping, or they may present a smooth, glistening, pink surface, instead of a granular appearance, sharply demarkated from the surrounding healthy mucous membrane.

*Pharynx.* Fifteen cases in the series. It is the posterior wall that is usually affected and the lesions appear as small nodules varying in size from a pinhead to areas having a diameter of about a quarter of an inch. Scarring is a distinct feature in this region.

\*Abstract from the Journal of Laryngology, Rhinology, Otology, January, 1920.

*Larynx.* Twenty-four cases, in five of which the epiglottis was involved alone, the lesions varying in severity from a simple redness to practically complete infiltration. This may continue to nodular infiltrations and eventually ulceration. In fifteen cases there was infiltration of the membrane either of an inter-arytenoid space, the ary-epiglottic folds, or the arytenoids themselves.

*Lymphatic Spread.* Lupus may spread by the lymphatics as well as by direct extension. The post-nasal lymphatic network communicates freely with the lymphatics of the pharynx and the upper surface of the soft palate. The vessels on the dorsum of the soft palate further the anastomose with those going to the under surface of the soft palate, the uvula and the tonsils. The lymphatic network anastomoses to a large extent with that of the pharynx, the mucosa of the supraglottic area being best supplied. Bear in mind the possibilities of the infection being carried in the lymph stream from the original focus in the nose; its appearance on the alveolus, palate, uvula, pharynx or larynx can be easily explained. What is difficult to explain is the fact that though the mucosa of the areas between the original focus in the nose for instance and the secondary lesion in the pharynx or larynx is freely traversed by the lymphatics which drain the former, there may be no sign of disease along the route.

*Treatment.* Treatment of various kinds may have an inhibitory effect and even a curative effect, but the latter are few. Among the agents employed are: First, tuberculin; second, salvarsan; third, electrical ionisation; fourth, curetting with or without the application of lactic acid; fifth, electrocautery; sixth, Pfannenstiel's treatment; seventh, X-ray. The first three of these methods have been abandoned because of the poor results secured. Lesions of the palate and alveolar process may be treated by curettement and the application of 75 per cent lactic acid. The electrocautery may be also applied for disease in the same area. For lupus of the nose Pfannenstiel's treatment is distinctly helpful. The diseased area is carefully scraped, the nasal cavities packed with gauze soaked in hydrogen peroxide, and sodium iodide is given internally. Nascent iodine is produced within the nasal fossa and acts upon the bacilli. In lupus of the epiglottis and the laryngeal mucosa removal of the diseased area with cutting forceps results in a cure or at least the arrest of the disease. The X-rays are now employed in selected cases. Of two cases who were treated with Finsen rays, both were benefited.

## NEW YORK ACADEMY OF MEDICINE.

SECTION ON OTOTOLOGY.

November 14, 1919.

### Two Cases of Gradenigo's Syndrome. DR. J. L. MAYBAUM.

#### DISCUSSION.

DR. BRAUN said that the cases reported by Dr. Maybaum were exceedingly interesting. The pathological process is not the same in all cases; the similarity of the symptoms is due to the fact that the location of the disease is the same: some get well and some die. He had occasion to see a case of Gradenigo's syndrome some months ago, in which autopsy disclosed the seat of the disease, and which had a very unusual etiology. The patient was a man forty years of age, who came to Mt. Sinai Hospital on Dr. A. A. Berg's service. He had a swelling on the side of the right jaw. A deep incision was made and pus found in the region of the sphenomaxillary fossa. The man did not do well, and a few days later he had a discharge from the right ear. When Dr. Braun saw the patient, the ear had been discharging for three weeks, and there was some tenderness over the mastoid. He had a fistula at the site of the incision over the jaw and a paralysis of the right external rectus; he also had headache and considerable pain in the face. An X-ray picture was taken and showed a slight blurring of the mastoid on the right side. In the region of the petrous pyramid there was a blur. A mastoid operation was performed and revealed a moderately involved mastoid. Dr. Berg made a temporal flap and lifted the temporo-sphenoidal lobe from the upper surface of the petrous pyramid. The bone and the dura looked perfectly normal. The temporo-sphenoidal lobe was punctured in various directions, but nothing was found. The pain in the face and the headache persisted, and the man became dizzy. Another operation was performed and the cerebellum and temporo-sphenoidal lobe again explored, but nothing was found. The man died and an autopsy showed that the entire petrous pyramid had broken down, and was filled with pus.

DR. KNIGHT said he had had two cases in the past year, one of them quite recently, in private practice. This patient was a child who had had a myringotomy performed by some out-of-town man, but the parents were worried about a pain in the back of the head from which the child was suffering. The discharge had ceased from the ear, but the drum was bulging posteriorly. It seemed advisable, however, to wait for a couple of days before proceeding to operation. The next day the mother phoned that the child was seeing double. She was instructed to keep the child in bed that day and to bring him down the next day; temperature about 99°. When he was seen a paralysis of the external rectus had developed on the affected side. The fundi, etc., were normal. X-ray examination showed nothing abnormal. This condition lasted for ten days or two weeks, when the muscle had partially recovered its former control and the child was practically well now, except that when he is



over-tired he suffers from weakness, and his eyes tend to converge. At the time he saw double he had an internal squint.

The other case was operated upon by me at the Manhattan Eye, Ear and Throat Hospital, in Dr. Duel's service last winter. Simple mastoidectomy first operation. Later sinus thrombosis developed and another operation was performed and the jugular vein of that side was ligated. It was after the jugular operation that it was noticed the external rectus muscle of that side was paralyzed. The paralysis of the external rectus in this case persisted although the patient is entirely well otherwise today. There were two small abscesses in the apex of the temporo-sphenoidal lobe of the brain. Examination of the pus showed the presence of actinomycosis. It was a case of lumpy-jaw and the infection had spread to the petrous pyramid from the sphenomaxillary fossa.

DR. J. L. MAYBAUM said that he had been particularly interested in the cases of Dr. Oppenheimer and Dr. Knight of sinus thrombosis associated with Abducens nerve paralysis. These are usually cases of cavernous sinus thrombosis. The Abducens nerve, at the apex of the petrous pyramid, is in a position directly external to the inferior petrosal sinus as it enters the cavernous sinus, so that thrombosis of the inferior petrosal sinus is likely to interfere with the function of the Abducens nerve. Some time ago, Dr. Page reported a case of otitis sinus thrombosis with sixth nerve involvement. On operation the lateral sinus was found free from clot, there was no bleeding from the jugular end. This was, undoubtedly, a case of jugular bulb thrombosis with extension of the clot into the inferior petrosal sinus.

The prognosis as to the paralysis of the external rectus is usually very good. Cases, however, have been reported in which permanent paralysis resulted. As to the necessity for immediate operation: If one can judge from the statistics of Gradenigo, Perkins and many others, a large number of cases recover without any further measure other than a thorough myringotomy. In a considerable number of cases reported by Dr. Gradenigo, mastoid operation disclosed either no changes or changes of a minor degree. Where drainage from the middle ear is insufficient and especially if the neuralgic pain shows no signs of abating, a mastoid operation should be done. Paralysis of the Abducens nerve is not, in itself, an indication for operation. In many cases which have recovered without operation, the sixth nerve paralysis persisted for weeks or even months, and in some cases permanent paralysis resulted. The sixth nerve in its passage through the narrow canal of Dorello, may suffer more or less serious damage as a result of pressure from localized edema or inflammatory exudate. This accounts for the more prolonged cases of external rectus paralysis. The first case reported by me and the case of Dr. Knight are examples of cases which recovered without further surgical intervention in spite of the presence of Gradenigo's syndrome.

Dr. Braun's case was unusually interesting not only because of the autopsy findings localizing the lesion in the petrous pyramid, but because of the extremely rare character of the infection. In the majority of cases the pathological changes are in the petrous pyramid. Atypical cases of an Abducens nerve paralysis, however, occur as result of the formation of an extradural abscess on the posterior surface of the pyramid. In such cases in addition to the sixth nerve, the seventh and eighth nerves

are also involved as these enter the internal auditory meatus. Such cases are not likely to be overlooked at the time of operation. Extradural abscess in region of the anterior surface of the petrous pyramid gives rise to severe trigeminal neuralgia before the onset of Abducens paralysis.

**The Value of Laboratory Examinations in Prognosis and Diagnosis in Oto-Laryngology.** DR. SEYMOUR OPPENHEIMER and DR. HARRY J. SPENCER.

Oppenheimer and Spencer emphasize the importance of the relationship between the laboratory and the work of the oto-laryngologist. The practitioner should be sufficiently conversant with laboratory methods to properly evaluate the technician's report.

Urine examination is considered practically a routine procedure; it should be repeated frequently as a routine, particularly in some conditions, mild tonsillitic attacks for example.

Temperature changes with accessory sinus infections are often metastatic processes attributable to a pyelitis, for example. With acute otitis in small children, careful urinary examination may disclose pyelitis as cause of a high temperature, and not a mastoid complication.

Glycosuria is dwelt upon, as it affects prognosis and clarifies treatment. If the sugar content of the blood is reducible, suppurative processes are handled with relative ease. Laboratory control of diet and medication allows determination of the most advisable time for operation in contemplated major surgical procedures, where not of an urgent nature. It also elevates prognosis.

Acetonuria is of valuable import. The question of an associated diabetes should be carefully determined. It may indicate acidosis of a gravity sufficient to account for symptoms, or to contra-indicate operative procedure at the time.

The importance of coagulation and bleeding time tests is taken up, especially with reference to suspicion hemophilic and purpuric conditions.

The value of the blood count is emphasized. In obscure suppurative conditions, the polynuclear count may be the deciding factor as to operation. The leucocyte count offers a good index as to resistance of the individual.

The sputum examination should be oftener performed, the predominating organism determined, and the gross characteristics of the sputum studied. Cultures should be frequently used to check up smears, etc.

The value of spinal fluid examination is emphasized, particularly the bacteriology after otitic disease. Cytologic examination should always be made, and this alone may determine a concurrent condition of importance. The globulin tests give some information. With a positive spinal fluid the intracranial and intraspinal condition is elucidated quickly. Only localized meningitis or abscess present a negative fluid. High pressure is important, but normal or low pressure may be of no significance. Discovery of organisms, especially the tubercle bacillus, is conclusive. Six to eight cells per c.c. are found normally, mostly mononuclear in type. Suppurative conditions exhibit a polynucleosis. A lymphocytosis may suggest tuberculosis, poliomyelitis or lues. An increase of pressure is frequently the only result of brain tumor or abscess.

Serologic tests of the blood, spinal fluid and the various serous effusions are proven in value. Standardization, rather than modification, of the Wassermann technic is urged. From study of two years' case histories with Wassermans as a routine, the conclusion is expressed that the great majority of these patients would not have had proper diagnosis without the test.

The value of complement fixation tests in determination of specific proteins in asthma and hay fever conditions, is not yet established. (An objection is that they are not localizing as to result.)

Bacteriologic smear and culture examinations are often of great value. The Gram stain helps to determine the predominating type of organism. Phagocytosis of a given organism indicates the one from which vaccine should be prepared, as also the effect of a vaccine in use. The organism of Vincent's angina can only be shown on smear as it does not grow on any known medium. The fusiform bacillus always mean necrosis. Mildly resistant conditions as those of the *M. catarrhalis* type are differentiated in smear from the more stubborn ones due to streptococci.

Nasal cultures in normal, healthy persons shows very few organisms, seldom over three kinds, usually in pure culture and avirulent. Healthy accessory sinuses are mostly found sterile.

As compared to the great variety in the mouth, but few organisms are found deep in crypts of enucleated tonsils, mostly in pure culture or small, mixed groups and of relatively few species. Negative smears mean nothing. An organism predominating in smear might be overgrown by another in culture.

Of great value when positive, negative cultures had best be disregarded as a rule.

A positive or negative blood culture is always significant; in a bacteremia the living organisms are constantly in the blood stream, while in a pyemia their presence is casual. Bacteremia is rare in most bone diseases, but not so with mastoid complications; here, however, it is not seen without a sinus thrombosis. The necessity for early operation in lateral sinus thrombosis is emphasized. Operation is advised with a positive blood culture. Blood culture in metastatic complications of suppurative otitis media is of value, and it should be possible to detect a bacteremia in every sinus thrombosis case at some time or other during the disease. The rule is laid down that with streptococci in the blood stream, a septic focus is existent and further operative procedure necessary. Bacteriologic indications for jugular vein ligation are given. In approximately 150 cases of sinus thrombosis no other organism than the streptococcus has been noted by Oppenheimer in blood culture. Culture from mastoid pus at time of operation should be made, and the value of tissue examination of material from mastoid operation is emphasized. The significance of a negative blood culture in conjunction with a non-streptococcic type of infection, is touched upon.

Cultures may form the starting point for elaboration of autogenous vaccines.

Status of the various cutaneous tests is given, and the value of the Schick reaction is emphasized. With reference to the question of specific proteins for diagnosis of the particular causative agent in pollen disease

or bronchial asthma, the tests afford greater exactness in diagnosis and improve prognosis where desensitization can be carried out.

The wide application of the Renal function tests is advocated, as especially applicable to all surgical procedures under general anesthesia. While relatively simple, Renal tests should be done only by a well-trained chemist.

In conclusion the opinion is expressed that where the practice of medicine, including the specialty of oto-laryngology, is as uncertain as it is, every safeguard should be thrown about it, and that the valuable aids of the laboratory should not be ignored. The importance of the clinical picture is emphasized, and where in conflict with the laboratory report, the man who studies both thoughtfully, is the one who will be able to best decide which to take as his guide at the critical moment.

#### DISCUSSION.

DR. SEYMOUR OPPENHEIMER said that he had seen seven cases of this condition and it was his impression that they are all due to a localized meningitis about the fibrous canal through which passes the sixth nerve and which Gradenigo called Dorello's canal after the Italian anatomist who first described it. In three of these cases the syndrome was present prior to operation and in four it occurred post-operatively. One of these cases had definite meningeal symptoms and three developed sinus thrombosis. One of the latter with an involvement of a cavernous sinus thrombosis. He believes that the prognosis as to the clearing up of the ocular paralysis after operation is good, but regards this triad as grave prognostically and in his judgment considers the same as an indication for prompt surgical interference even although the mastoid symptoms may be indefinite.

DR. OPPENHEIMER said that Dr. Haskin had raised the question of sinus thrombosis due to staphylococcus infection. Any infection may cause a sinus thrombosis, but in his own experience he had not seen any case where the organism had been other than the streptococcus \* \* \* or the streptococcus mucosus, and he had utilized that fact as an indication in advising for or against operation. Given a case where an operation has been performed and the mastoid pus showed a pneumococcus and the patient subsequently develops symptoms suggestive of a sinus thrombosis and the blood culture has been negative, he had held that owing to the fact that the organism discovered was not of the streptococcus group it was advisable to defer operation, and in all these instances the subsequent development of events showed something else which explained the symptomatology. One can only estimate the value of facts on the basis of one's individual experience, and up to the present time his experience not having shown any other organism other than the streptococcus causing a sinus thrombosis, he felt justified in advising accordingly in such cases.

He did not wish to enter too much into the academic question as to the rights of the specialist in a case referred by another physician or by another patient, but he felt very much in accord with what Dr. Manges had said—that the specialist has very definite rights and should safeguard his own reputation, and when an individual comes for counsel, whether from another physician or from someone else, one should acquire all the facts necessary in order to express a logical opinion, and if a urinary or other

laboratory examination is necessary, the specialist should employ all the means available, and even at times disregard the reports rendered from other sources. He then cited an instance to show what sometimes may happen.

A patient came to him last spring with a throat lesion which clinically suggested a tertiary syphilitic infection. The history was that he had been under the care of one of the most noted dermatologists, who, on the opinion expressed to him by another physician that a laboratory had found a negative Wassermann, considered the cutaneous lesions as non-specific. These lesions consisted of a horribly punched out excavation over various portions of the body. The dermatologist pronounced the case as one of blastomycosis. Dr. Oppenheimer immediately had the Wassermann reaction again taken and found it to be four plus. The patient was placed immediately upon anti-syphilitic treatment, and the lesion in his throat as well as those on the body promptly healed up. Other cases might be cited where urinary and other conditions were found to exist, although he had been told that examinations had been made. In treating all his cases Dr. Oppenheimer ignored all such statements unless coming from very reliable sources and proceeds along the line that will place in his possession all the facts which will guide him in the most intelligent manner in dealing with the patient. He realized that it was not practicable for everyone to have a laboratory so close at hand, that these examinations can be made on the premises, but we are in some respects far behind many small towns in the country where a group of physicians get together and maintain a laboratory for mutual interest. Why is not something like that practical here in New York?

DR. H. J. SPENCER said that little could be added to what Dr. Oppenheimer had said, but that certain phases of the paper might be emphasized a little more, especially the chemical blood examinations. The work along this line done at the Post-Graduate Hospital had been done also at other centers, in this city and elsewhere, and its importance had been demonstrated. Other tests previously employed were more complicated, as for example, the Mosenthal test diet which has been employed to estimate the function of the kidney and its ability to throw out waste products—to throw out concentrated urine. Gradually these have been tried and more or less abandoned; are not used as much as they were. The reason for this is the exactness with which the chemical tests can be made and the real prognosis which can be based upon their findings.

DR. MORRIS MANGES said that Dr. Oppenheimer had presented very admirably the balance between the value of the clinical phenomena and the laboratory examinations. The only fault to be found with the paper was its title. Instead of limiting it to the oto-laryngologists, it should be applied to all specialists, and, not least, to the general practitioner. Dr. Manges said he did not believe he was making an over-estimate in stating that not over 5 per cent of the general practitioners make their own urine analyses. The usual routine is for them to have their reports from the laboratories, and when they report as their own you are not sure that these reports are reliable. If that is true of the general practitioner what could be said of the specialists, who, as a rule, are more limited in their examinations than the general practitioner? There reports from the laboratories, and when they report as their own you are



was no excuse for this. The laboratory work should be used as an adjunct; the routine work should be done by the general practitioner and the specialists. This routine work can be done in five minutes and puts one on guard in regard to conditions that may require more careful attention. An ordinary blood smear can be studied in very little time and will supply enough data to determine whether or not further examinations are required; but if one depends upon the laboratories for routine work he will often miss the valuable aids that Dr. Oppenheimer was striving to impress.

The dire results of the neglect of this routine work by the specialist and the general practitioner had just been impressed upon him most forcibly by a case of a very acute nephritis after a quinsy—illustrating the relation of laboratory work to tonsillitis. The patient was a man 35 years of age, who gave a history of a severe quinsy lasting about two weeks. About four or five days after the attack he did not feel well enough to attend to his work, and came home. Not until then did doctor have a specimen of urine examined; the patient developed a very acute nephritis, which will probably terminate fatally. Had that man's urine been examined early as a routine measure, he would probably have escaped the complication.

Dr. Oppenheimer gave 75 per cent as the frequency of albuminuum after tonsillitis. That was probably too high, but a high figure should be allowed. Dr. Oppenheimer had also referred to the occurrence of murmurs during an acute tonsillitis. It is surprising how frequently these systolic murmurs can be detected during an acute tonsillitis. They usually disappear during convalescence. Too much emphasis could not be placed upon the point made by Dr. Oppenheimer—that every case of tonsillitis should be regarded from the standpoint of the urine, and also the heart.

All the throat specialists have regarded symptoms in the mouth from only the standpoint of syphilis, tuberculosis and possibly gout. Dr. Oppenheimer had wisely emphasized how much more knowledge can be obtained in this direction by the routine work which he so splendidly uses in his own practice. Everyone knows that the mouth gives many valuable diagnostic hints. Dr. Manges said that he had written a paper on the diagnostic importance of the mouth, giving fifteen or twenty conditions in which systemic disease could be determined by the examination of the mouth alone.

If every oto-laryngologist would make use of routine laboratory tests in his every-day work, he would soon learn its value in the diagnosis, prognosis and treatment of his cases. For instance, acute leukemia may first be seen by the throat man. The manifestations are there; the change is in the tonsils, or fauces, which are covered with a thick membrane of a pure watery gray color, which bleeds easily. It looks to most men like a Vincent's angina, and unless one is on his guard, he is apt to regard it as a Vincent's angina; but a blood examination would at once reverse the condition. That was simply one instance of what a throat man could learn by routine examinations.

Then there was the value of routine blood examinations in operative procedures. Dr. Manges then cited the case of a young man who had had a recent attack of tonsillitis and wanted to have his tonsils removed during his vacation. He had arranged with an aural surgeon for the opera-



tion, but the surgeon wisely advised against it at the time, but the young man insisted that he wanted it done during his vacation, and against his better judgment the surgeon operated. Death resulted from an acute sepsis. Had the surgeon taken a count at that time he would have fortified his judgment and could have resisted the young man's appeal. It is seldom necessary to take the trouble to make a full count; a very slight examination of the slide, requiring only five minutes, will give enough indication to determine when a full count is needed.

Dr. Manges said that some years ago he had read a paper on lung abscesses before this section in which he showed that some cases of tonsillectomy were done when the patient was not in a proper condition on account of some antecedent cold. He felt sure that that paper on lung abscesses had not done any harm. Patients with lung abscesses were now admitted much less frequently to Mount Sinai Hospital than formerly. That emphasized the need of the care of patients before operation, and in this case the routine laboratory work will be no small part in the preparation.

Anesthesia pneumonia would be lessened in frequency if this care were taken. It seems probable that many of these cases are due to the patients having been predisposed to pneumonia by an antecedent cold rather than on account of an insult to the lung itself.

The renal tests are also of great value and should be employed where the routine examinations show the existence of a nephritis. If a patient has nephritis and a high blood pressure, it should be a phenolsulphonephthaline test and by the blood nitrogen estinctures; but they are not necessary unless there is a marked nephritis. As to diabetes and acidosis, these, too, could be extended as their significance by simple tests. Preparation of patients for operations could be accomplished better by a reduction of the fats and a moderate reduction of the carbo-hydrates. One need not make the patient sugar-free to make him safe for operation. Cut out the fats and don't drown them in bicarbonate of soda. That is a great mistake in the preparation of diabetic patients, for in the over-use of bicarbonate of soda you change the metabolism and interfere with the free elimination of fluid which is so essential in diabetics.

In an obscure case of sepsis Dr. Oppenheimer had referred to pyelitis as an obscure cause; should not be overlooked, because a pyelitis is always characterized by an oscillating temperature like a septic curve.

Dr. KOPETSKY said that it was like carrying coals to Newcastle to attempt to add anything to the details of the paper presented by Dr. Oppenheimer and the discussion by Dr. Manges, but he wished to emphasize a point or two. It was conceded that laboratory findings are a great aid to diagnosis, and the various tests of the secretions and excretions are of undoubted value and should all be carried out; but while saying that one must not over-emphasize it from the standpoint of the otologist or the oto-laryngologist. If one were in the relation of general medical adviser, such examinations would come within his scope; but if, on the other hand, one is acting as a specialist, these examinations are simply part of the general examination of the patient, and the responsibility for them rests on the medical attendant. From the standpoint of diagnosis of the otolaryngological lesion not too much importance should be attached to the findings of the laboratory. The clinic is the leading factor in making any

diagnosis; where the clinic fails to furnish data sufficient to establish a fact, then the laboratory is of undoubted value.

Referring to the case of the child where the question of mastoiditis and pyelitis came up; the specialist should answer the question of the presence or the absence of the mastoiditis; the practitioner should answer the question of pyelitis. Dr. Kopetsky said he was not deprecating the fact that laboratory examinations should be made. Dr. Oppenheimer was undoubtedly doing fine work along these lines, but from what had been said by the various speakers it should not be inferred that the specialist himself should make these examinations in the practice of oto-laryngology. Dr. Kopetsky said he was in complete accord with Dr. Oppenheimer in what he had said about the significance of the clinical picture as a criterion.

The laboratory substantiates the finding at the bedside. Where the bedside operation is insufficient to furnish diagnostic data, the laboratory's aid is sought. Where the findings from the laboratory are in conflict with the clinical findings, Dr. Kopetsky thought that the clinic was the best guide.

DR. HAYS said he would make no attempt to discuss the paper from the laboratory or otological point of view. The amount of knowledge shown by Dr. Oppenheimer in laboratory technic and interpretation showed that there was much for all to learn, but not too much for anyone to know. Another point was that the class of cases which the otologist is called upon to treat might be classified into three groups: hospital cases, private cases, and those referred by other doctors and by other patients. These three groups have to be managed very differently. Everyone with a hospital practice knew how much better he is able to treat these cases than at home, as he has the aid of other men and of the laboratory service. In the cases referred by private patients we are able to do more for them than when referred by a physician, when professional etiquette has to be considered; but one ought to be able to make any test or examination that is necessary to reach a diagnosis, and if it is anything out of his line he should be able to refer the patient to the proper specialist; but in these cases referred by other doctors one is up against it many times. Sometime ago a patient had come to him with an indefinite condition and he had a Wassermann test made; when the physician was informed of this, he stated that Dr. Hays had gone beyond his province; and if one has a patient's urine examined or some laboratory test made he is liable in such cases to overstep the usual medical politeness which all indulge in more or less. There was no question but that these laboratory examinations form a very valuable adjunct to any nose and throat specialist, and the same thing might be said of X-ray examinations, etc. It all comes to the point that the oto-laryngologist's realizing that he should have a knowledge of other things besides purely nose and throat conditions, and should freely use these aids to diagnosis.

DR. GERARD H. COX said that in Dr. Oppenheimer's very excellent paper no mention had been made of what he considers a very important subject, viz., a laboratory diagnosis of tuberculosis in chronic suppurative middle ear lesions. A few years ago Petroff and Miller devised a culture medium for growing tubercle bacilli in from ten days to two weeks. At that time he and Dr. Dwyer applied the method to the ear and cultivated tubercle

bacilli from chronic suppurating ears of children. In a series of cases he found that about 15 per cent of all chronic suppurating ears in children were tuberculous. This work was reported in the *British Journal of Laryngology, Rhinology and Otology*, in the July, 1916, number. It seemed to the speaker that this subject of tuberculosis of the middle ear was worthy of more study and investigation by the members of the section.

DR. HASKIN, referring to Dr. Cox's remarks, said that he did not wish the members of the section to go away with the idea that 12 per cent of all chronic suppurative infections of the ear were found to be from the tubercle bacillus; the number of cases actually examined had shown this percentage. If all chronic suppurative ears had been examined no such percentage would have been found. Dr. Oppenheimer had spoken of finding only streptococcus in his mastoid cases, with bacteremia; but he (Dr. Haskin) knew of three cases of staphylococcus infections where bacteremia followed and the patients all died—so that could not be barred out as a dangerous element. It was not found nearly so often as the streptococcus, but we do see staphylococcus mastoiditis. The section was to be congratulated on the opportunity of hearing Dr. Oppenheimer's excellent paper.

DR. MANGES said that, speaking as a general practitioner, not as a specialist, and judging by his experience with other physicians as to their unreliability in reporting urine and other tests, the man who undertakes the responsibility of an operation undoubtedly has a right to make his own examinations, and should not depend upon the possible misstatements or misinformation of others.

DR. BRAUN said that probably all were agreed on the great value of laboratory examinations in oto-laryngology. As Dr. Kopetsky had wisely said, we should not neglect the clinical examinations for the laboratory side. There are cases, however, in which the results of clinical examination differ from the laboratory tests, and the laboratory tests prove to be the more reliable. An instance of this was the case of a patient in one of the medical wards at Mt. Sinai Hospital; a young woman who was admitted with a chronic discharging ear. She had intense headache, a fairly low temperature, 101° F., and a pulse of 60. A lumbar puncture showed a sterile fluid containing 200 or 300 cells to the cubic m.m. It looked like a typical brain abscess of otitic origin, and operation was advised. The examinations of the spinal fluid showed that cells were mostly small lymphocytes and the medical men thought it might be a case of tubercular meningitis. Dr. Braun said that he saw the case two or three days later. The condition was about the same, and he again advised operation. In the meantime another lumbar puncture had been made with similar findings. A few days later the patient developed typical meningitic signs, stiff neck, strabismus, Kernig, etc. A lumbar puncture done at this time showed a fluid containing tubercle bacilli. The patient died, and autopsy revealed a typical tubercular meningitis.

## THE PHILADELPHIA LARYNGOLOGICAL SOCIETY.

*(Continued from page 128, February, 1920.)*

DR. KEELER (in closing): I wish to add to Dr. Kaufman's case. My case was one of chronic ear discharge for fifty-seven years and consented to operation, without any coaxing. I found no antrum but did discover an extradural abscess. In operating I went down the posterior superior wall of the auditory canal and did not find the antrum then, missing the facial nerve by a hair's breadth. I then went from without into antrum, which was extremely shallow, found a little sinus and got a few drops of pus. A large opening to the dura was found and an extradural abscess.

I wish to add to my case: Second sister has an ear condition also. Enunciation was bad, you could not understand a word he was trying to tell you. This patient could not turn over in bed without vomiting. I have secured a skull and reproduced the operation on this specimen. In order to preserve the lateral sinus in this specimen I did not dare to remove as much of the bone over the sinus as I did in the operation as I wanted to preserve the sinus at the time of operation. I could take the nerve up on the incus hook. The face twitched so I let it alone. I would like to say that this evening I tested his spontaneous nystagmus and past pointing. He has no spontaneous nystagmus and no past pointing. His balance is normal, falling is normal—in fact he does not fall at all. He has somewhat diminished nystagmus, 15 on turning to right. His past pointing on turning to the right is 20 right, 15 left; left hand comes over to the inner side, when past pointing to the right hand is 5. Was out shooting rabbits since he has been home. This man was not able to walk without assistance. No paralysis except slight facial.

I will attempt to answer questions asked. I went down into the mastoid cavity, saw bone moving and took forceps, caught the sequestrum, moved it, saw it rock, thought best to leave alone as the facial nerve was caught in it. The after treatment was as follows: Introduced a piece of gauze into the abscess cavity and closed the posterior wound which healed by first intention. The lateral sinus was already obliterated. The man had had persistent vomiting without nausea, caused by the slightest movement. He always kept his eyes closed to avoid the vertigo. He had marked pain on the side of the head and especially in the back. Everything seemed to indicate a cerebellar involvement. He had no control whatever of his feet. It looked like a perfectly clear case with history of ear polyp growth, discharge of pus in auditory canal, suspected cerebellar abscess. At operation the pus kept on coming and an instrument was introduced pretty far into the cerebellum, carrying piece of gauze with it and drainage through external canal established. The findings justified operation and result also.

DR. KAUFMAN (in closing): Answering Dr. Coates, I found nothing that would indicate any reason for the infection traveling in that direction to hear of the number of cases mentioned where no antrum was discovered or why there should be an extradural abscess so far back. I am surprised at the time of operation.

**Two Cases of Fibromyxoma of the Larynx. DR. ARTHUR J. WAGERS.**

*Case 1.* M. E. B. Soldier, age 30, white.

Civil occupation, engineer. In military service 13 months.

Family history, negative.

Previous personal history negative except for chancroidal infection at the age of 15, which had been treated and cured.

This man was ready for discharge from the service and was found to be in perfect physical condition except that his voice was extremely hoarse. Because of this he was referred to the hospital.

The history showed that hoarseness had been present for nearly a year, and that at times the patient was conscious of some obstruction to breathing. There had never been any pain, and while at times the hoarseness appeared to be improving, it had never entirely disappeared.

Examination of the larynx disclosed the presence of a small pear-shaped growth about the size of a pea. Its surface was smooth, pinkish gray in color, and its smaller end was attached to the anterior wall of the larynx immediately below the vocal cords at the anterior commissure.

The attachment of this growth was sufficiently pedunculated to permit of its passing upward between the cords during forced expiration.

The vocal cords themselves were practically normal in appearance. There were no areas of infiltration either above or below the cords. This patient suspected that the hoarseness was due to cigarette smoking, a habit which he indulged rather freely.

*Case 2.* Two days after the appearance of this patient, a second soldier, also a candidate for discharge from the service, was sent to the hospital for the same reason—hoarseness. This was a colored man, 28 years of age. Had been in service 13 months.

Family and personal history, negative. Denied venereal infection but admitted drinking freely of beer and moderately of whisky before entering the service.

Hoarseness had come on gradually following arrival in France eight months previously. Patient had not been ill at any time and was unable to offer any suggestion as to the possible cause of his condition.

On examination of the larynx, a smooth growth the size of a split French pea was seen to be attached immediately above the anterior commissure, with a slight portion of the sessile base extending backward along the free margin of the right vocal cord. The cords themselves were slightly congested.

Aside from the slight difference in the location of the growth in the two cases, the same description would almost answer for both.

Both men had been in service the same length of time. Both had been free of symptoms at the time of entering service. Neither had been ill while in the service and had been able to perform the duties assigned them at all times. With the exception of the occasional sense of obstruction to respiration noted in the first case, the only discomfort experienced by either had been that due to the hoarseness alone. In neither case was there any infiltration or ulceration in the tissues surrounding the growths.

The growths themselves were evidently benign and the indication for treatment was their removal.

This I did, the two cases being operated upon the same day.

General anesthesia was employed. With the patient's head extended over the end of the table and supported by an assistant, the Jackson tubular speculum was introduced and a satisfactory view of the growth obtained. It was then not a difficult matter to seize the growth in such a manner as to cut it at its point of attachment, the instrument used being the Cordes straight punch forcep operated by the universal handle.

The same procedure was employed in each case. Hemorrhage was negligible.

The after treatment consisted in rest in bed for 24 hours with cold compresses applied to the larynx externally during the first six hours. Use of the voice was forbidden for 48 hours.

Six days after operation, both patients were discharged from the hospital. The voice in the first case was normal. In the second case there was marked improvement, but still slight roughness of the voice.

Histologically, the growths removed resembled nasal polypi but differed from these in containing a greater proportion of fibrous elements, hence the designation of fibromyxoma rather than mucous polyp.

Dr. Wagers regretted that he was unable to present the cases as they were seen in military service.

#### DISCUSSION.

DR. F. O. LEWIS: I had one case of fibromyxoma of the larynx a few years ago. Patient was a man from whom I removed a fibromyxoma but it seemed to recur. I should be strongly tempted to try radium in this type of case. It has been so successful in fibroma of other organs and satisfactory in some of the malignant cases of the larynx, that I would first try this out.

#### Case of Carcinoma of the Antrum. DR. PHILIP S. STOUT.

This patient had pain, could not breathe, and was finally referred to me. I found much destruction. I took her down to the hospital and had part of the mass removed and a specimen sent to the laboratory to make a diagnosis, if possible, between sarcoma and carcinoma. To operate further seemed not to be a proper thing to do—suggested that she use radium which was quite successful. The mass has gone down considerably with the exception that under one eye there is quite a little bulging. Eye itself is lost, but the hard palate, which was not inflamed, has gone back almost to its normal size. There was slight obstruction to the nose for a while—the radium reduced that so that she can breathe quite well. I do not know whether the improvement will continue but I will be glad to bring her in if possible at the next meeting. She has had about 40 hours of radium so far, applied in mass. Put in layers in needle form is better than laying on. On nose, cheek, and last time directly under eye. It seems to do the work but may come back later on.

#### Case of Adeno-Carcinoma of the Nares. DR. DAVID N. HUSIK.

The patient I wish to present this evening is one of adenocarcinoma of the left nares with extension to the left antrum, and naso-pharynx,



the diagnosis having been made with the aid of the microscope. Prior to the pathologic report we were treating this case as one of sarcoma, because the clinical picture was typical of sarcoma.

The history of the case is as follows: A. W., 33, U. S. machinist, widower, has two children, mother, two brothers, and two sisters living and well. No history of malignancy in family. About four years ago he began to complain of headaches lasting 24 hours and limited to the left side. These would come on frequently, and he soon became accustomed to them. About a year ago (August, 1918), he began to notice slight obstruction to the left nasal fossa which gradually became worse until completely blocked. He was referred to us early in July, complaining of complete obstruction, in left nares, pain in antral and frontal region, and about left eye. Examination shows left nares blocked by a large irregular, pedunculated mass, boggy to touch, and bleeds very easily, covered with a mucopurulent discharge, and nasal landmarks could not be made out. Cocaine and adrenaline had little effect on this mass. Transillumination reveals a dark area below the left eye and over two-thirds of internal aspect of left antrum. Right side negative. X-ray taken by Dr. Pancoast shows involvement of left antrum. All other sinuses negative.

On subsequent visits we began using snare and biting forceps, but the bleeding was so profuse that little tissue at a time could be removed. After a half dozen sittings, we were able to clear the anterior half of nares, and the patient felt so much better that he failed to show up. One morning while in the bath room without cause, he had a severe hemorrhage, and came for further observation.

External examination at this time (about Nov. 1) shows left eye, and cheek more prominent. Internal examination shows anterior half of left nasal fossae still clear, but the mass has travelled to the naso-pharynx. His symptoms, especially pain, are much more exaggerated and he also says he is getting deaf in his left ear. A mass of tissue was removed, and sent to Dr. A. J. Smith, who kindly sent me the following report. (This report is much condensed to save time.) The general appearance of the histological structure would tend to its classification as an infiltrative adeno-carcinoma of origin in a mucous-secreting gland such as occur in the mucous membrane of the nose, with modification of the cells to the small size above noted.

During the last four weeks we have treated this case with radium, 50 mg. So far he has had 20 hrs. treatment, 7 hrs. to floor of nose, 6 hrs. to naso-pharynx, and 7 hrs. above middle turbinate. His symptoms have all been relieved and the patient is able to blow his nose. He will shortly be admitted to the University Hospital for an external radical operation and we will follow it up with radium. During the last year we have been using radium in non-operable malignant cases of the upper air tract with encouraging results. All cases of adeno-carcinomas that have had the most radical operations, have usually recurred in from one to two years.

#### DISCUSSION.

DR. ROSS HALL SKILLERN: These cases of malignant involvement of the sinuses of the head are hopeless. There seems to be some doubt in

the diagnosis of Dr. Stout's case of carcinoma of the antrum. I have never seen a case of carcinoma of the antrum but sarcoma of the antrum is common in various kinds. All sarcomas of the antrum are fatal with exception of the predunculated variety. Curiously enough if you can get a predunculated case and can take it off at its original insertion, you will probably cure it, particularly if it is followed by X-ray. I have had very little experience with radium, probably with my association with Dr. Pfahler, who says X-ray can do anything radium can. The X-ray seems to offer hope in this case but I am very skeptical. I believe everyone will eventually die. The diagnosis of sarcoma of the antrum is difficult as it may be confused with a dentigerous cyst. Sarcomas give very few symptoms until you get inside, when they look like pig's brains. They should be cleaned out thoroughly. It always seems impossible to get all of the growth out in well advanced cases. In a very short time they recur, not necessarily in the same spot but in neck, in the lungs, etc. Some have recurred in sphenoid. If the X-ray offers nothing, efforts to get them under radium should be made.

DR. F. O. LEWIS: I have seen two cases of sarcoma of the antrum during the last six months. One was a girl whom Major Adams saw and diagnosed. It was a round cell sarcoma. Radium was used without any success. I did a resection of upper jaw and found involvement of the orbit and ethmoids. She did well for two days but died of meningitis on the third day, from infection through ethmoids. The other case—was a young man, 20 years of age, who had been treated for some time for a nasal condition. I removed part of the tissue and it was to be round cell sarcoma. I went in under the lip and removed a portion of anterior wall and also a large portion of the growth for further pathological study. Afterwards we used radium in the antrum carefully and allowed it to remain for nine hours, both inside the antrum and in the nose. He is absolutely well apparently, the swelling has gone down and there are no symptoms at all. There is no pain and the nose is clear. He feels perfectly well.

DR. LEWIS FISHER: I wish to ask Dr. Husik regarding the pain in the application of radium. I recently had a case—a woman with carcinoma of the antrum and ethmoid but did not make a diagnosis at first, as it looked like ethmoiditis. I curetted the ethmoid cells, never suspecting carcinoma, and found a pocket full of pus. The only thing suspecting malignancy was marked recurrence after two weeks, the nose becoming full again. I sent section to the laboratory for examination and the report was carcinoma. The patient was referred to Janeway of New York, who used radium emaciations—not directly but applied in small glass tubes and imbedded them in tissue and let them stay there. In one week the patient came home and said she would not go again as pain was so terrific. She said she would rather have the disease.

DR. GEORGE M. COATES: I used radium in one case in the last two years. It was a sarcoma of the soft palate extending back into the naso-pharynx. I think it was seen in May, 1917, having been treated for peri tonsillar abscess with incision into the mass. Dr. Pancoast used radium in this case and after one application the mass disappeared. The patient reported to me to be watched. By August he showed some signs of recurrence.

At this time he went away for two weeks and came back with nasopharynx absolutely blocked and full of a mass the size of a small orange. As I went into the service at that time, the case was turned over to someone else and I never heard the subsequent history, but radium did clear up the case in one dose with no sign of symptoms at first. In a couple of months it came back again worse than ever and I do not know whether second application cleared it up or not.

DR. PHILIP S. STOUT (in closing): The laboratory made the diagnosis for me but I thought it was sarcoma. I will take some more pieces for further study.

DR. DAVID N. HUSIK (in closing): This patient before having radium applied had severe pain and actually begged for relief. After his first application of radium, which was given seven hours to the nose, he slept all night and was better. I now have two cases of inoperable carcinoma of the larynx treated with radium with favorable results. One case—a woman, 74, has large epitheloma base of tongue, the size of a half a dollar, which was cleared up by applications of radium. Six months after the last treatment, it recurred and we are still using radium.

**Two Cases of Plastic Surgery of the Nose.** DR. MATTHEW S. ERSNER.

Case 1. Mr. B., age 25. When six years old, was kicked by a horse and since has a saddle nose. Patient always had good breathing space through both nostrils.

Case 2. Mr. M. F., age 24, occupation, prize fighter. The reason he has given up the pugilistic arena was on account of nasal injury which he repeatedly sustained during the performance. He claims that most of his opponents knew his weakness, which was the nose, and therefore took advantage of him.

In case 1 septal cartilage was transplanted from another patient upon whom a submucous was performed at the same time.

In case 2 I transplanted three pieces of bone obtained from another submucous resection done simultaneously. The only precautions observed were Wassermann tests. As long as the donor and recipient gave negative fixations, I felt that they were good subjects. There is no doubt that thicker and stronger bone, such as obtained from rib and tibia, are ideal; but I felt that we might attain as good results with these simpler methods; and thus not expose the patient to a pneumothorax or osteomyelitis.

Case 1 made rapid recovery and good cosmetic results.

Case 2 has a good cosmetic result but after three weeks developed a small sinus on roof of nose with occasional drop of pus, but it is improving rapidly.

Photographs and plaster paris cases taken prior to operation and after operation were shown.

**TECHNIQUE.**

1. Left nasal cavity was sterilized with one-third tincture iodine and alcohol.

2. Pledges of 10 per cent cocaine were placed in each nasal vestibule.

3. Carters Technique was employed.

- (a) Tip of nose raised.

(b) Scalpell introduced into roof of nose at a point midway the upper and lower lateral cartilages.

(c) The tissues over dorsum of nose were freely elevated after which the desector was turned downward to tip of nose making sort of a pocket.

(d) When the nasal frontal process was reached, the periosteum was freely elevated and the bony grafts transplanted therein.

Anesthetic used. Novocain 1 per cent with 10 drops of adrenalin to half ounce of solution.

In connection with Dr. Ersner's case, Dr. George M. Coates presented a case of nasal deformity corrected by operation six days previously. Patient, a captain in the Dental Corps, U. S. Army, had had his nose badly injured several times playing basket ball a few years previously. Subsequently a submucous resection had been done so that the breathing was good, but there remained a very marked prominent hump on the bridge of the nose corresponding to the junction of the lower ends of the nasal bones and the cartilage. This hump was angular and considerably widened, and there was a large irregular section covering it. *The operation* local anesthesia, novocain 1 per cent, incision of both scar tissue, elevation of periosteum, removal of hump by a mallet chisel, suture of the periosteum and intracuticular suture of the skin. The wound was covered with a heavy gauze collodion splint. No edema followed. The result is good.

**Implantation of Tibial Graft for the Correction of Saddle Back Deformity of the Nose. DR. LEWIS FISHER.**

The case was that of a young woman, age 20, who had practically no nose. There was no septum or bridge. The Wassermann was negative. It did not seem to me that a piece of ridge used as a graft would be thick enough. I took a portion of the tibia, having difficulty in getting it down low enough. I started the incision anterior the nasal bones and had trouble after I got all the way up to bring the graft down again, but finally got it into position. Three or four days afterwards, I found a swelling which I thought was simply traumatic. It was fluctuating, however, and the thing got infected. I surely thought I would have to take the graft out but I tried Dakin's oil on it. I made a little niche in the cavity where the graft was and injecting several drops of Dakin's oil every day, the thing cleared up, though the result was not as good as it might be. The graft was absolutely floating in pus and it was made to take. Outside of that there is nothing interesting in the case.

**DISCUSSION.**

DR. H. C. MASLAND: All of these bone operative cases are just in their infancy. Much of the operative work done at the present time is far from successful and the profession is endeavoring to find the exact cause. It is interesting to read just what they do attribute the ill effects to. Great stress has been laid upon the fact that normal salt solution should not be used and gloves should not handle the bones. We do not know what the trouble is and are looking around for some. We know that tissue which has been kept in normal salt solution for a period

of time and then removed and laid aside is not going to be as good as bone that is kept in sterile salt solution. If we handle tissue with gloves, I do not see why there should be any injurious effect if we handle bone with gloves. In regard to bone surgery, it should be remembered that the bone is sensitive to trauma and should be handled as carefully as the soft tissues. The question of regeneration of bone and the permanency of the bone implantation has made many think and definite conclusions have been arrived at. It is thought now that if bone is to unite and remain permanent, it must be in actual contact with live bone. We have to have contact in order to get union. There should be contact of the graft with vital bone in order to have a permanent result. In using the high speed electric saw there should be water dropped so as not to scar the bone. There is destruction of the surface osteoblasts during the process of the sawing. The vitality of the bones depends upon the vitality of the osteoblasts. In regard to bone that is implanted, the bone itself will eventually disappear, but in the meanwhile it acts as a scaffold for the osteoblasts to travel on. The original bone may disappear, but it has acted as a scaffold for the production of new bone.

DR. GEORGE M. COATES: Carter in New York has done more of this work probably than anyone else. He has been using a graft from the rib with part of the cartilage attached. The cartilage is placed in the lower part of the incision which insures a flexible tip to the nose. He also has taken radiographs as long as eight or nine years after operation which show that the bone graft is still in position, though whether it is the original bone or has been replaced by new bone is a question. In a recent paper he said that in a number of these cases, the bone apparently had continued to grow as shown by X-ray study made four, five or six or more years after operation. In his later cases, he operates intranasally and infection does not occur. An autogenous graft is better than one from another subject, but it is often so easy to get grafts from others. In Dr. Ersner's cases, one worked beautifully and in the other the result was good.

DR. WALTER L. CARISS: Dr. Fisher spoke of Dakin's oil. Two years ago I did a graft which became infected and I used Dakin's oil for some time without result. I then had to take the graft out.

DR. M. S. ERSNER: A Wassermann was done on both patients but that is the only precaution we took.

**Case of Tubercular Laryngitis.** DR. ROBERT J. HUNTER.

This case is reported chiefly from the standpoint of early tubercular laryngitis without involvement demonstrable in any other part of body. Most of these cases show involvement of lung. This case gives a history of having been hoarse for about a year, noticed some soreness in throat but did not consult a doctor until October. Some cough, some secretion, quite marked loss of weight, 26 pounds in past two years. When first seen there was a marked mass on both ventricular bands, some slight ulceration, no inflammation, cords not visible at that time. Referred to medical clinic—reports were negative on the chest and the X-ray report was negative. The Wassermann was negative. First X-ray examination was made by the fluoroscope which was negative, but now a plate was made, which was negative also except a suggestion of a possible lesion

visible on plate. I put her on mixed treatment which made her quite sick; later on I removed a specimen and have a section of that with me. It shows very clearly tubercular lesions. I wish to ask the experiences of men on these cases, whether they have found many cases where tuberculosis was not demonstrable in other parts of the body. It is not altogether typical of tuberculosis—at times this ventricular mass at ventricular bands goes down and can get a glimpse of the cords below, which look rather roughened. The question of local treatment with radium arises.

## DISCUSSION.

DR. EDWARD W. COLLINS: I have seen quite a bit of tubercular laryngitis without manifestations of lung symptoms—the first manifestations appearing in the larynx only having peribroncheal infection without having any peripheral involvement. Speaking of the use of radium in the treatment of tubercular laryngitis, the use of pure carbolic acid as a medicinal agent, touched locally on ulcer without any previous cocaineization, controls it very markedly. Carbolic acid also controls pain and does not produce edema in tuberculous tissue as it does in healthy tissue.

DR. GEORGE M. COATES: It is always a question whether you can say that tubercular laryngitis is primary or not. It is pretty hard definitely to rule out inactive foci in the lungs that are very small in size. You can have a marked tubercular laryngitis without any active lesion that can be demonstrable in the lungs and it is hard to say that there has not been any previous infection in the lungs. It is a hard question to decide whether there is such a thing as real primary tuberculosis of the larynx before it can be demonstrated elsewhere in the body.

DR. ROBERT J. HUNTER (in closing): X-ray plate shows one slightly suggestive shadow, but Dr. Miller said he would not care to diagnose that as tuberculosis. It may be tuberculosis, however.

MATTHEW S. ERSNER, *Recorder.*



